

# START

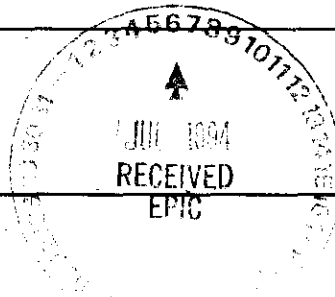
JUN 22 1994

0037117

## ENGINEERING DATA TRANSMITTAL

Page 1 of 1

2. To (Receiving Organization)		3. From (Originating Organization)		4. Related EDT No. <b>603633</b>	
Distribution		Env. Restoration Engineering		N/A	
5. Proj./Prog./Dept./Div.: <b>85900</b>		6. Cog. Engr.: <b>A. D. Krug</b>		7. Purchase Order No.: <b>N/A</b>	
8. Originator Remarks: <b>Release</b>				9. Equip./Component No.: <b>N/A</b>	
11. Receiver Remarks:				10. System/Bldg./Facility: <b>N/A</b>	
				12. Major Assm. Dwg. No.: <b>N/A</b>	
				13. Permit/Permit Application No.: <b>N/A</b>	
				14. Required Response Date: <b>N/A</b>	



15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1.	WHC-SD-EN-TI-266		0	Data Validation Report for the 100-KR-4 Operable Unit First Quarter, 1994	Q	1/2	1	

16. KEY		
Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)										(G)	(H)
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
2	1	Cog. Eng. A.D. Krug	<i>[Signature]</i>	6/14/94	H6-02	Central Files (2)			L8-04	3	
2	1	Cog. Mgr. R.P. Henckel	<i>[Signature]</i>	6/14/94	H6-02	IRA Clearance (2)			H4-17	3	
2	1	QA D.G. Farwick	<i>[Signature]</i>	6/14/94	H4-16	HASM: K.N. Pool	<i>[Signature]</i>	6/14/94	H4-23		2
		Safety				EPIC (8) (1)			H6-08	3	
		Env.									
3		EPIC			H6-08						
3		EDMC (2)			H6-08						

18. <i>[Signature]</i> A. D. Krug Signature of EDT Originator		19. <i>[Signature]</i> Authorized Representative for Receiving Organization		20. <i>[Signature]</i> Cognizant Manager		21. DOE APPROVAL (if required) Ctrl No. _____ <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments	
6-14-94 Date				6-14-94 Date			

# INSTRUCTIONS FOR COMPLETION OF THE ENGINEERING DATA TRANSMITTAL

(USE BLACK INK OR TYPE)

BLOCK	TITLE	
(1)*	EDT	• Pre-assigned EDT number.
(2)	To: (Receiving Organization)	• Enter the individual's name, title of the organization, or entity (e.g., Distribution) that the EDT is being transmitted to.
(3)	From: (Originating Organization)	• Enter the title of the organization originating and transmitting the EDT.
(4)	Related EDT No.	• Enter EDT numbers which relate to the data being transmitted.
(5)*	Proj./Prog./Dept./Div.	• Enter the Project/Program/Department/Division title or Project/Program acronym or Project Number, Work Order Number or Organization Code.
(6)*	Cognizant Engineer	• Enter the name of the individual identified as being responsible for coordinating disposition of the EDT.
(7)	Purchase Order No. ....	• Enter related Purchase Order (P.O.) Number, if available.
(8)*	Originator Remarks	• Enter special or additional comments concerning transmittal, or "Key" retrieval words may be entered.
(9)	Equipment/Component No.	• Enter equipment/component number of affected item, if appropriate.
(10)	System/Bldg./Facility	• Enter appropriate system, building or facility number, if appropriate.
(11)	Receiver Remarks	• Enter special or additional comments concerning transmittal.
(12)	Major Assm. Dwg. No.	• Enter applicable drawing number of major assembly, if appropriate.
(13)	Permit/Permit Application No.	• Enter applicable permit or permit application number, if appropriate.
(14)	Required Response Date	• Enter the date a response is required from individuals identified in Block 17 (Signature/Distribution).
(15)*	Data Transmitted	
	(A)* Item Number	• Enter sequential number, beginning with 1, of the information listed on EDT.
	(B)* Document/Drawing No.	• Enter the unique identification number assigned to the document or drawing being transmitted.
	(C)* Sheet No.	• Enter the sheet number of the information being transmitted. If no sheet number, leave blank.
	(D)* Rev. No.	• Enter the revision number of the information being transmitted. If no revision number, leave blank.
	(E) Title or Description of Data Transmitted	• Enter the title of the document or drawing or a brief description of the subject if no title is identified.
	(F)* Impact Level	• Enter the appropriate Impact Level (Block 15). Also, indicate the appropriate approvals for each item listed, i.e., SQ, ESQ, etc. Use NA for non-engineering documents.
	(G) Reason for Transmittal	• Enter the appropriate code to identify the purpose of the data transmittal (see Block 16).
	(H) Originator Disposition	• Enter the appropriate disposition code (see Block 16).
	(I) Receiver Disposition	• Enter the appropriate disposition code (see Block 16).
(16)	Key	• Number codes used in completion of Blocks 15 (G), (H), and (I), and 17 (G), (H) (Signature/Distribution).
(17)	Signature/Distribution	
	(G) Reason	• Enter the code of the reason for transmittal (Block 16).
	(H) Disposition	• Enter the code for the disposition (Block 16).
	(J) Name	• Enter the signature of the individual completing the Disposition 17 (H) and the Transmittal.
	(K)* Signature	• Obtain appropriate signature(s).
	(L)* Date	• Enter date signature is obtained.
	(M)* MSIN	• Enter MSIN. Note: If Distribution Sheet is used, show entire distribution (including that indicated on Page 1 of the EDT) on the Distribution Sheet.
(18)	Signature of EDT Originator	• Enter the signature and date of the individual originating the EDT (entered prior to transmittal to Receiving Organization). If the EDT originator is the cognizant engineer, sign both Blocks 17 and 18.
(19)	Authorized Representative for Receiving Organization	• Enter the signature and date of the individual identified by the Receiving Organization as authorized to approve disposition of the EDT and acceptance of the data transmitted, as applicable.
(20)*	Cognizant Manager	• Enter the signature and date of the cognizant manager. (This signature is authorization for release.)
(21)*	DOE Approval	• Enter DOE approval (if required) by letter number and indicate DOE action.

\* Asterisk denote the required minimum items check by Configuration Documentation prior to release; these are the minimum release requirements.

947278-0791

Date Received: <b>6/21/94 NS</b>		<b>INFORMATION RELEASE REQUEST</b>		Reference: WHC-CM-3-4	
Complete for all Types of Release					
Purpose <input type="checkbox"/> Speech or Presentation <input type="checkbox"/> Full Paper <input type="checkbox"/> Summary <input type="checkbox"/> Abstract <input type="checkbox"/> Visual Aid <input type="checkbox"/> Speakers Bureau <input type="checkbox"/> Poster Session <input type="checkbox"/> Videotape			<input type="checkbox"/> Reference <input checked="" type="checkbox"/> Technical Report <input type="checkbox"/> Thesis or Dissertation <input type="checkbox"/> Manual <input type="checkbox"/> Brochure/Flier <input type="checkbox"/> Software/Database <input type="checkbox"/> Controlled Document <input type="checkbox"/> Other		
			ID Number (include revision, volume, etc.) <b>WHC-SD-EN-TI-266, Rev. 0</b>		
			List attachments.		
			Date Release Required <div style="text-align: center;"><b>June 15, 1994</b></div>		
Title: Data Validation Report for the 100-KR-4 Operable Unit First Quarter, 1994				Unclassified Category <b>UC-630</b>	
New or novel (patentable) subject matter? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has disclosure been submitted by WHC or other company? <input type="checkbox"/> No <input type="checkbox"/> Yes Disclosure No(s).				Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)	
Copyrights? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has written permission been granted? <input type="checkbox"/> No <input type="checkbox"/> Yes (Attach Permission)				Trademarks? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)	
Complete for Speech or Presentation					
Title of Conference or Meeting <b>N/A</b>				Group or Society Sponsoring	
Date(s) of Conference or Meeting		City/State		Will proceedings be published? <input type="checkbox"/> Yes <input type="checkbox"/> No Will material be handed out? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Title of Journal <b>N/A</b>					
CHECKLIST FOR SIGNATORIES					
Review Required per WHC-CM-3-4		Yes      No		Reviewer - Signature Indicates Approval	
				<div style="display: flex; justify-content: space-between;"><u>Name (printed)</u>      <u>Signature</u>      <u>Date</u></div>	
Classification/Unclassified		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Controlled Nuclear Information		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Patent - General Counsel		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Legal - General Counsel		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Applied Technology/Export		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Controlled Information or International Program		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
WHC Program/Project		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Communications		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
RL Program/Project		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		E. D. Goller <i>OK per 6/21/94 mtg. LTH</i> 6/21/94	
Publication Services		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		L. S. Hermann <i>L. S. Hermann</i> 6/21/94	
Other Program/Project		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Information conforms to all applicable requirements.      The above information is certified to be correct.					
References Available to Intended Audience Transmit to DOE-HQ/Office of Scientific and Technical Information <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<b>INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP</b> Stamp is required before release. Release is contingent upon resolution of mandatory comments.			
Author/Requestor (Printed/Signature) <b>A. D. Krug</b> <i>A. D. Krug</i> 6/14/94					
Intended Audience <input type="checkbox"/> Internal <input type="checkbox"/> Sponsor <input checked="" type="checkbox"/> External Responsible Manager (Printed/Signature) <b>R. P. Henckel</b> <i>R. P. Henckel</i> 6/14/94					
		Date Cancelled		Date Disapproved	

THIS PAGE INTENTIONALLY  
LEFT BLANK

## SUPPORTING DOCUMENT

1. Total Pages 138

2. Title Data Validation Report for the 100-KR-4 Operable Unit First Quarter, 1994	3. Number WHC-SD-EN-TI-266	4. Rev No. 0
5. Key Words volatiles, semivolatiles, pesticides/PCB, inorganics, wet chemistry, gross alpha/beta, alpha and gamma spectroscopy  <b>APPROVED FOR PUBLIC RELEASE</b>	6. Author Name: A. P. Krug <i>A. P. Krug</i> 6/14/94 Signature  Organization/Charge Code 85900/P711A	
7. Abstract <i>6/22/94 W. J. J. J.</i> WHC, 1994, Data Validation Report for the 100-KR-4 Operable Unit First Quarter, 1994, WHC-SD-EN-TI-266, Rev. 0, prepared by A. T. Kearney, Inc. for Westinghouse Hanford Company, Richland, Washington.		
8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.  PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contract with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.  DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.		10. RELEASE STAMP  <div data-bbox="1006 1060 1453 1291"><b>OFFICIAL RELEASE</b> BY WHC DATE JUN 22 1994 <i>[Signature]</i></div>
9. Impact Level Q		

**THIS PAGE INTENTIONALLY  
LEFT BLANK**

**DISCLAIMER**

----- This report is designated as Revision 0. The report covers a specific site for a specific sampling time frame. The report addresses only those samples that have been provided for data validation review.

All related quality assurance samples, including all field quality control samples, were reviewed and validated to verify that reported sample results were of sufficient quality to meet quality control objectives.

66077846

THIS PAGE INTENTIONALLY  
LEFT BLANK



## ACRONYMS

%D	Percent difference
AA	Atomic absorption
BFB	Bromofluorobenzene
BNA	Base/neutral and acid (equivalent to semivolatiles)
CCB	Continuing calibration blank
CCV	Continuing calibration verification
CLP	Contract Laboratory Program
CRA	CRDL standard for AA
CRDL	Contract required detection limit
CRI	CRDL standard for ICP
CRII	CRDL standard for ICP initial
CRIF	CRDL standard for ICP final
CRQL	Contract required quantitation limit
CV	Coefficient of variation
CVAA	Cold vapor atomic absorption
DBC	Dibutylchloroendate
DFTPP	Decafluorotriphenylphosphine
DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
GC/MS	Gas chromatography/mass spectrometry
GC	Gas chromatography
GFAA	Graphite furnace atomic absorption
GPC	Gel permeation chromatography
ICB	Initial Calibration Blank
ICP	Inductively coupled plasma emission spectrometry
ICS	ICP interference check sample
ICSAB	Interference check sample solution AB
ICV	Initial calibration verification
IDL	Instrument detection limit
LCS	Laboratory control sample
LCSS	Laboratory control sample soil
LCSW	Laboratory control sample water
MSA	Method of standard addition
MS/MSD	Matrix spike/matrix spike duplicate
NV	Not Validated
PB	Preparation blank
PCB	Polychlorinated biphenyl
PEM	Performance evaluation mixture
QA	Quality assurance
QC	Quality control
RDL	Required Detection Limit
RF	Response factor
RIC	Reconstructed ion chromatogram
RPD	Relative percent difference
RRF	Relative response factor
RRT	Relative retention time
RSD	Relative standard deviation
RT	Retention time
SDG	Sample delivery group
SOW	Statement of work
TAL	Target analyte list

TCL	Target compound list
TIC	Tentatively identified compounds
TOC	Total organic carbon
TOX	Total organic halides
TPH/DRO	Total petroleum hydrocarbons/diesel range organics
V	Validated
VOC	Volatile organic compounds

9600-1278-116

CONTENTS

1.0	INTRODUCTION . . . . .	1-1
2.0	INORGANIC DATA VALIDATION . . . . .	2-1
3.0	GROSS ALPHA AND GROSS BETA DETERMINATION DATA VALIDATION . . . . .	3-1
4.0	ALPHA SPECTROSCOPY DATA VALIDATION . . . . .	4-1
5.0	STRONTIUM-90 DETERMINATION DATA VALIDATION . . . . .	5-1
6.0	CARBON-14 DETERMINATION DATA VALIDATION . . . . .	6-1
7.0	TRITIUM DETERMINATION DATA VALIDATION . . . . .	7-1
8.0	REFERENCES . . . . .	8-1

660-9178146  
944278-097

THIS PAGE INTENTIONALLY  
LEFT BLANK

## 1.0 INTRODUCTION

The following samples were obtained from the 100-KR-4 Operable Unit First Quarter 1994 Groundwater Sampling event:

B09W42	B09W57	B09W72	B09W87
B09W43	B09W58	B09W73	B09W88
B09W44	B09W59	B09W74	B09W89
B09W45	B09W60	B09W75	B09W90
B09W46	B09W61	B09W76	B09W91
B09W47	B09W62	B09W77	B09W92
B09W48	B09W63	B09W78	B09W93
B09W49	B09W64	B09W79	B09W94
B09W50	B09W65	B09W80	B09W95
B09W51	B09W66	B09W81	B09W96
B09W52	B09W67	B09W82	B09W97
B09W53	B09W68	B09W83	B09WF1
B09W54	B09W69	B09W84	B09WF2
B09W55	B09W70	B09W85	
B09W56	B09W71	B09W86	

The data from the chemical analysis of fifty-eight samples from this sampling event and their related quality assurance samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. The samples were analyzed by Thermo-Analytic Laboratories (TMA) and Roy F. Weston Laboratories (WESTON) using U.S. Environmental Protection Agency (EPA) CLP protocols.

Sample analyses included:

- Inorganics.

The table below lists the Sample Delivery Groups (SDGs) that were validated for this sampling event. The validated data and the non-validated results for the remaining samples are included in this report.

SDG No.	Matrix	No. of Samples Analyzed	Parameters
B09W92	W	4	Inorganics
9401L298	W	6	Inorganics
9401L299	W	6	Inorganics
9401L314	W	18	Inorganics
9401L347	W	6	Inorganics
9401L365	W	6	Inorganics
9401L391	W	4	Inorganics
9401L441	W	2	Inorganics
9402L458	W	4	Inorganics
9402L462	W	2	Inorganics

Twenty-five samples were validated for radiochemical parameters by TMA and Teledyne. Analytical protocols specified in the Westinghouse Hanford Company Statement of Work for Nonradioactive Inorganic/Organic and Radiochemical Analytical Services were used. Sample analyses included the following:

- Gross alpha and gross beta determination
- Alpha spectroscopy
- Strontium-90
- Carbon-14
- Tritium.

SDG No.	Matrix	No. of Samples Analyzed	Parameters
B09W92	W	2	Radiochemistry
40023	W	3	Radiochemistry
40031	W	3	Radiochemistry
40039	W	9	Radiochemistry
40053	W	3	Radiochemistry
40521	W	3	Radiochemistry
40529	W	2	Radiochemistry
40971	W	1	Radiochemistry
40977	W	2	Radiochemistry
40984	W	1	Radiochemistry

9401L298-0799

The radiochemical data summary tables can be found following Section 7.8.

Data quality was reviewed and analytical results validated using Westinghouse-Hanford procedures and related EPA CLP protocols and guidelines. Data were qualified based upon their quality and the guidance provided by these sources. In instances where the two protocols differed, the Westinghouse-Hanford guidance was followed.

Two sets of split samples were submitted to TMA and Roy F. Weston Laboratories as shown below:

Set 1:

<u>Sample No.</u>	<u>Split Sample No.</u>	<u>Well Location</u>
B09W72	B09W92	199-K-35
B09W73	B09W93	199-K-35

Set 2:

<u>Sample No.</u>	<u>Split Sample No.</u>	<u>Well Location</u>
B09W76	B09W94	199-K-37
B09W77	B09W95	199-K-37

The sample and split samples for both well locations were included in the validated data. The results were compared using the sample guidelines for determining the RPD between a sample and its duplicate. All results fell within the required control limit. All results for both well locations appear in the summary tables within this report.

Two sets of field duplicate samples were submitted to TMA as shown below.

Set 1:

<u>Sample No.</u>	<u>Duplicate Sample No.</u>	<u>Well Location</u>
B09W72	B09W88	199-K-35
B09W73	B09W89	199-K-35

Set 2:

<u>Sample No.</u>	<u>Duplicate Sample No.</u>	<u>Well Location</u>
B09W76	B09W90	199-K-37
B09W77	B09W91	199-K-37

The duplicate sample results for both well locations were included in the validated data. The results were compared using the sample guidelines for determining the RPD between a sample and its duplicate. All results fell within the required control limit. All results for both well locations appear in the summary tables within this report.

Two sets of equipment blanks were submitted to Weston as shown in the table below. Both sets were collected on 1/17/94 and 1/25/94, and designated EB-1 and EB-2, respectively.

Set 1:

Set 2:

Sample NumberSample Number

B09W84

B09W86

B09W85

B09W87

Under EPA protocol, equipment blanks are water samples used to indicate whether or not decontamination procedures were adequate or that contamination was not inherent in the equipment used. The equipment blank information provided was inadequate to determine what contamination, if any, was a result of the equipment used. Equipment blanks require well number locations and associated sample numbers in order to make such a determination.

The report is broken down into sections for each chemical analysis and radiochemical analysis type. Each section addresses the data package completeness, holding time adherence, instrument calibration and tuning acceptability, blank results, accuracy, precision, system performance, as well as the compound identification and quantitation. In addition, each section has an overall assessment and summary for the data packages reviewed for the particular chemical/radiochemical analyses. Detailed backup information is provided to the reader by SDG No. and sample number. For each data package, a matrix of chemical analyses per sample number is presented, as well as data qualification summaries.

Laboratory and data validation personnel added qualifiers to the reported data based on specified data quality objectives. The data reporting qualifiers are summarized as follows:

- U - Indicates the analyte was analyzed for and not detected. The value reported is the sample quantitation limit corrected for dilutions and moisture content. It should be noted that the sample quantitation limit may be higher or lower than the contract or method required detection limit, depending on instrumentation, matrix and concentration factors.
- J - Indicates the analyte was analyzed for and detected. However, the associated value is considered to be an



estimate due to identified QC deficiencies. Data flagged with a "J" may be usable for decision making purposes, depending upon the DQOs of the project. Laboratories qualify all reported organic detects below CRQL with a "J" per the CLP procedures.

- UJ - Indicates the analyte was analyzed for and not detected. However, the associated detection limit is considered to be an estimate due to identified QC deficiencies. Detection limits flagged with a "UJ" may be usable for decision making purposes, depending upon the DQOs of the project.
- JN - Indicates the analyte was analyzed for and that there is presumptive evidence of the presence of the compound. The concentration reported is considered an estimate which should be used for informational purposes only.
- R - Indicates the analyte was analyzed for and detected, however due to a significant QC deficiency, the data are deemed unusable. Analytic results flagged "R" are invalid and provide no information as to whether or not the analyte is present.

UR - Indicates the analyte was analyzed for and not detected, however due to a significant QC deficiency, the data are deemed unusable. Analytic results flagged "UR" are invalid and provide no information as to whether or not the analyte is present.

It should be noted that, frequently, results will bear two qualifiers - one given by the laboratory and one given during the validation process. For example, a "U" qualifier is given by the laboratory when the compound has not been detected during the analysis, and a "J" qualifier may be added during the validation to qualify the result due to minor quality problems. Therefore, the resulting qualification is "UJ", where the "U" qualifier has been given by the laboratory and the "J" qualifier given by the validator.

The results of data validation performed for the 100-KR-4 Operable Unit First Quarter 1994 Sampling Investigation are contained in the tables following each of the chapters in this report.

Several general quality trends which resulted in data qualification were observed. These included:

- The metals analysis showed minor matrix spike accuracy problems; analytical spike problems, lab duplicate precision problems and ICP serial dilution problems were below the QC limit. Approximately 20 percent of the metals results were flagged "J" due to these factors.

2080-1128-116

- Both positive and negative laboratory blank contamination was noted in the inorganics analysis. Associated results were flagged accordingly. Contamination, however, was not sufficiently high to affect the usability of the data.
- Due to precision results outside of QC limits, Uranium-234 results in one SDG and Uranium-238 and Uranium-234 in another SDG were qualified as estimates.
- Due to low LCS recoveries, several Uranium-235 results in two data packages were rejected.
- Due to low LCS recoveries, Uranium-235 results in several data packages were qualified as estimates.
- Due to high radiochemical yields, Carbon-14 results in several data packages were qualified as estimates.
- Reported MDA values for two alpha spectroscopy results and one carbon-14 result were above the RDL.
- Due to the blank and/or LCS not being run with the SDG, several radiochemistry results in one data package were qualified as estimates.

In general, the protocol-specific QA/QC requirements were met for the samples analyzed in this investigation with the exceptions noted above and discussed in detail in the chapters to follow. All requested analyses were performed.

With the exceptions noted above, the protocol-specific data quality objectives in terms of precision, accuracy, completeness, representativeness, and comparability have been met.

2080-8226-146

941327810001

WELL AND SAMPLE INFORMATION						SAMPLE LOCATION INFORMATION
SAMPLE LOCATION	SAMPLE NUMBER	MATRIX	DATE SAMPLED	NV/V	INORGANICS	
199-K-11	B09W42	W	01/11/94	V	2-39	
199-K-13	B09W44 B09W45	W W	01/12/94	V V	2-50 2-50	
199-K-18	B09W46 B09W47	W W	01/11/94	V V	2-39 2-39	
199-K-19	B09W48 B09W49	W W	01/11/94	V V	2-39 2-39	
199-K-20	B09W50 B09W51	W W	01/13/94	V V	2-50 2-50	
199-K-21	B09W52 B09W53	W W	01/13/94	V V	2-50 2-50	
199-K-22	B09W54 B09W55	W W	01/13/94	V V	2-50 2-50	
199-K-23	B09W56 B09W57	W W	01/13/94	V V	2-50 2-50	
199-K-27	B09W58 B09W59	W W	01/25/94	V V	2-92 2-92	
199-K-30	B09W60 B09W61	W W	01/20/94	V V	2-84 2-84	
199-K-31	B09W62 B09W63	W W	01/24/94	V V	2-78 2-78	
199-K-32A	B09W64 B09W65	W W	01/18/94	V V	2-67 2-67	
199-K-32B	B09W66 B09W67	W W	01/18/94	V V	2-67 2-67	
199-K-33	B09W68 B09W69	W W	01/20/94	V V	2-73 2-73	
199-K-34	B09W70 B09W71	W W	01/13/94	V V	2-51 2-51	

WELL AND SAMPLE INFORMATION					SAMPLE INFORMATION LOCATION
SAMPLE LOCATION	SAMPLE NUMBER	MATRIX	DATE SAMPLED	NV/V	INORGANICS
199-K-35	B09W72	W	01/14/94	V	2-51
	B09W73	W	01/14/94	V	2-51
	B09W88	W	01/14/94	V	2-51
	B09W89	W	01/14/94	V	2-51
	B09W92	W	01/14/94	V	2-20
	B09W93	W	01/14/94	V	2-25
199-K-36	B09W74	W	01/14/94	V	2-51
	B09W75	W	01/14/94	V	2-51
199-K-37	B09W76	W	01/17/94	V	2-60
	B09W77	W	01/17/94	V	2-60
	B09W90	W	01/17/94	V	2-60
	B09W91	W	01/17/94	V	2-60
	B09W94	W	01/17/94	V	2-29
	B09W95	W	01/17/94	V	2-34
699-70-68	B09W78	W	01/12/94	V	2-45
	B09W79	W	01/12/94	V	2-45
699-73-61	B09W80	W	01/12/94	V	2-45
	B09W81	W	01/12/94	V	2-45
699-78-62	B09W82	W	01/12/94	V	2-45
	B09W83	W	01/12/94	V	2-45
EB-1	B09W84	W	01/17/94	V	2-60
	B09W85	W	01/17/94	V	2-60
EB-2	B09W86	W	01/25/94	V	2-84
	B09W87	W	01/25/94	V	2-84
TB-1	B09W96	W	01/18/94	V	2-67
	B09W97	W	01/18/94	V	2-67
TB-2	B09WF1	W	01/21/94	V	2-73
	B09WF2	W	01/21/94	V	2-73

940327R.0805

## 2.0 INORGANIC DATA VALIDATION

### 2.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and checked for completeness:

B09W92	9401L314	9401L391	9401L462
9401L298	9401L347	9401L441	
9401L299	9401L365	9401L458	

A nonconformance report was included with the verification documentation for SDG No. 9402L462. The report stated that sample numbers B09W58 and B09W59 in SDG No. 9402L462 were received at the laboratory with the Chain-of-Custodies (COCs) for sample numbers B09W86 and B09W87 in SDG No. 9402L458 and vice versa. The COCs were broken and the response by Westinghouse-Hanford was to continue with the requested analyses and use the results for informational purposes.

### 2.2 HOLDING TIMES

Analytical holding times for ICP metals, GFAA metals and CVAA mercury analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: samples must be analyzed within 28 days for mercury, and within six months for all other metals.

The 28-day holding time requirement was exceeded and the associated results were flagged "UJ" for mercury:

- Sample numbers B09W42, B09W43, B09W46, B09W47, B09W48 and B09W49 in SDG No. 9401L298.
- Sample numbers B09W44, B09W45, B09W50, B09W51, B09W52, B09W53, B09W54, B09W55, B09W56, B09W57, B09W70, B09W71, B09W72, B09W73, B09W74, B09W75, B09W88 and B09W89 in SDG No. 9401L314.
- Sample numbers B09W64, B09W65, B09W66, B09W67, B09W96 and B09W97 in SDG No. 9401L365.
- Sample numbers B09W60, B09W61, B09W86 and B09W87 in SDG No. 9402L458.
- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

All other holding time requirements for all analytes in all data packages reviewed were met.

### 2.3 INSTRUMENT PERFORMANCE AND CALIBRATIONS

Performance of specific instrument quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are outlined below.

Three calibration standards and a blank were analyzed for arsenic, lead, selenium and thallium by GFAA. The correlation coefficient of a least squares linear regression met the requirements for calibration in all cases.

Up to five calibration standards and a blank were analyzed for mercury by CVAA. The correlation coefficient of a least squares linear regression met the requirements for calibration.

At least one standard and a blank were analyzed by ICP for all other elements.

The above calibrations were each immediately verified with an ICV standard and a calibration blank. The ICV was prepared from a source independent of the calibration standards, at a mid-calibration range concentration. The ICV percent recovery must fall within the control limits of 90 to 110 percent for metals analyzed by ICP and GFAA, and 80 to 120 percent for mercury. Calibration linearity near the detection limit was verified with a standard prepared at a concentration near the CRDL.

The ICVs met the recommended control limits in all cases.

The calibrations were subsequently verified at regular intervals using a CCV standard. The control windows for percent recovery of CCV standards are the same as the ICV windows described above.

CCV checks were not performed at the proper frequency for mercury in SDG No. 9402L462. CCV1 was run after the analysis of the first ten samples. Under Inorganics CLP-SOW protocol, a CCV check is required at the beginning and end of each run in addition to the 10% (2-hour) frequency.

The CCVs met the recommended control limits in all cases.

#### 2.3.1 ICP Calibration

An ICS was analyzed at the beginning and end of each ICP sample run to verify the laboratory interelement and background correction factors. Results for the ICS solution must fall within the control limit of  $\pm 20$  percent of the true value. Arsenic, lead, selenium and thallium were analyzed using a

4080-678-116  
9473278-000

Thermo-Jarrell Ash ICP61E. Under USEPA CLP protocol, this is acceptable provided the ICP is able to meet the required detection limits and the analytical run follows the USEPA CLP protocol for ICP analysis. Under the ICP method, an ICS is required for lead at a concentration of 1.0 mg/L. Refer to Table 2, page E-14, of the USEPA CLP ILM01.0.

A five-fold serial dilution is required for all elements analyzed by ICP. The subsequent concentrations of the reanalysis are compared with the original analysis. If the analyte concentration is sufficiently high (a minimum factor of 50 above the IDL) then the serial dilution must agree within 10% of the original determination after correction for dilution.

The ICS has been analyzed at the proper frequency and all ICSAB solution percent recovery values fell within the control limit.

### 2.3.2 Atomic Absorption Calibrations

Duplicate injections are required for all GFAA analyses. The duplicate injections establish the precision of the individual analytical determinations. For sample concentrations greater than the CRDL, duplicate injections must agree within  $\pm 20$  percent RSD or CV. The AA calibration results are discussed further in Section 2.7 of this report.

## 2.4 BLANKS

### 2.4.1 Positive Blank Results

In the case of positive blank results, samples with digestate concentrations (in ug/L) of less than five times ( $< 5x$ ) the highest amount found in any of the associated blanks have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times ( $> 5x$ ) the highest amount found in any of the associated blanks do not require qualification.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for aluminum:

- Sample numbers B09W93, B09W94 and B09W95 in SDG No. B09W92.
- Sample number B09W62 in SDG No. 9401L441.
- Sample number B09W60 in SDG No. 9402L458.

Due to the presence of laboratory blank contamination, the following sample was flagged "U" for antimony:

- Sample number B09W47 in SDG No. 9401L298.

8080-2727-0808

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for arsenic:

- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.
- Sample number B09W58 in SDG No. 9402L462.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for barium:

- Sample numbers B09W78 and B09W79 in SDG No. 9401L299.
- Sample numbers B09W52 and B09W53 in SDG No. 9401L314.
- Sample numbers B09W76, B09W77, B09W85, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W64 and B09W65 in SDG No. 9401L365.
- Sample number B09WF2 in SDG No. 9401L391.
- Sample number B09W59 in SDG No. 9402L462.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for calcium:

- Sample number B09W84 in SDG No. 9401L347.
- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.
- Sample numbers B09W69 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for cobalt:

- Sample numbers B09W46 and B09W47 in SDG No. 9401L298.
- Sample number B09W76 in SDG No. 9401L347.
- Sample number B09W67 in SDG No. 9401L365.
- Sample number B09WF1 in SDG No. 9401L391.
- Sample number B09W62 in SDG No. 9401L441.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for copper:

- Sample numbers B09W54, B09W55, B09W57 and B09W71 in SDG No. 9401L314.
- Sample numbers B09W64, B09W65 and B09W67 in SDG No. 9401L365.

6080-8726-16  
9473279-0809



Due to the presence of laboratory blank contamination, the following samples were flagged "U" for iron:

- Sample numbers B09W94 and B09W95 in SDG No. B09W92.
- Sample numbers B09W43 and B09W49 in SDG No. 9401L298.
- Sample numbers B09W79, B09W80, B09W81, B09W82 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W45, B09W51, B09W53, B09W56, B09W57, B09W71, B09W73, B09W75 and B09W89 in SDG No. 9401L314.
- All samples in SDG No. 9401L347.
- Sample numbers B09W60, B09W61, B09W86 and B09W87 in SDG No. 9402L458.
- Sample number B09W59 in SDG No. 9402L462.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for magnesium:

- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for sodium:

- Sample numbers B09W84 and B09W85 in SDG No. 9401L347.
- Sample numbers B09W69 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for vanadium:

- Sample numbers B09W42, B09W43, B09W46, B09W47, B09W48 and B09W49 in SDG No. 9401L298.
- Sample numbers B09W78, B09W79, B09W80, B09W81, B09W82 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W44, B09W45, B09W50, B09W51, B09W57, B09W70, B09W72, B09W73, B09W75, B09W88 and B09W89 in SDG No. 9401L314.
- Sample numbers B09W76, B09W77, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

- Sample numbers B09W60, B09W61, B09W86 and B09W87 in SDG No. 9402L458.
- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

Due to the presence of laboratory blank contamination, the following samples were flagged "U" for zinc:

- Sample numbers B09W92 and B09W94 in SDG No. B09W92.
- Sample numbers B09W42, B09W43, B09W46 and B09W49 in SDG No. 9401L298.
- Sample numbers B09W78, B09W79, B09W81 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W45, B09W50, B09W51, B09W52, B09W53, B09W56, B09W57, B09W71, B09W72, B09W73, B09W75, B09W88 and B09W89 in SDG No. 9401L314.
- Sample numbers B09W76, B09W77, B09W84, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W64, B09W65, B09W66 and B09W67 in SDG No. 9401L365.
- Sample numbers B09W68, B09W69, B09WF1 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.
- Sample numbers B09W60, B09W61, B09W86 and B09W87 in SDG No. 9402L458.
- Sample number B09W59 in SDG No. 9402L462.

All other laboratory blank results were acceptable.

Sample numbers B09W96, B09W97, B09WF1 and B09WF2 were designated as trip blanks by Westinghouse-Hanford. The following trip blank results were above the IDL:

- Calcium, iron, nickel and zinc results in sample number B09W96 in SDG No. 9401L365.
- Calcium and iron results in sample number B09W97 in SDG No. 9401L365.
- Barium, calcium, chromium, iron, magnesium, potassium, sodium, vanadium and zinc results in sample number B09WF1 in SDG No. 9401L391.
- Aluminum, barium, calcium, iron, sodium and zinc results in sample number B09WF2 in SDG No. 9401L391.

As per Westinghouse-Hanford guidelines, qualifications of sample results is not required based on trip blank results.

#### 2.4.2 Negative Blank Results

In the case of negative blank results, if the absolute value of any calibration blank exceeds the Instrument Detection Limit (IDL), all non-detects are qualified as estimates and flagged "UJ", and all positive results within two times the absolute value of the blank result are qualified as estimates and flagged "J". In the case of preparation blanks, if the absolute value exceeds the Contract Required Detection Limit (CRDL), all non-detects are rejected and flagged "R" and all detected that are less than ten times the absolute value of the preparation blank result are qualified as estimates and flagged "J".

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for aluminum:

- Sample numbers B09W42, B09W43, B09W46 and B09W49 in SDG No. 9401L298.
- All samples in SDG No. 9401L299.
- Sample numbers B09W64, B09W65, B09W66, B09W96 and B09W97 in SDG No. 9401L365.
- Sample number B09W59 in SDG No. 9402L462.

Due to the presence of negative laboratory contamination, the following samples were flagged "J" for aluminum:

- Sample numbers B09W47 and B09W48 in SDG No. 9401L298.
- Sample number B09W67 in SDG No. 9401L365.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for antimony:

- Sample numbers B09W50, B09W54, B09W55, B09W56, B09W57, B09W71, B09W72, B09W73 and B09W75 in SDG No. 9401L314.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for cobalt:

- All samples in SDG No. 9401L299.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for copper:

- Sample number B09W93 in SDG No. B09W92.
- All samples in SDG No. 9401L299.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for lead:

- Sample numbers B09W85, B09W90 and B09W91 in SDG No. 9401L347.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for magnesium:

- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for manganese:

- Sample numbers B09W94 and B09W95 in SDG No. B09W92.

Due to the presence of negative laboratory contamination, the following sample was flagged "UJ" for nickel:

- Sample number B09W60 in SDG No. 9402L458.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for potassium:

- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

Due to the presence of negative laboratory contamination, the following samples were flagged "J" for potassium:

- All samples in SDG No. 9401L299.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.
- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for sodium:

- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for selenium:

- All samples in SDG No. 9401L314.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for thallium:

- All samples in SDG No. 9401L314.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

Due to the presence of negative laboratory contamination, the following samples were flagged "UJ" for vanadium:

- All samples in SDG No. 9401L299.
- All samples in SDG No. 9401L314.
- All samples in SDG No. 9401L347.
- All samples in SDG No. 9401L365.

Due to the presence of negative laboratory contamination, the following samples were flagged "J" for zinc:

- Sample number B09W95 in SDG No. B09W92

## 2.5 ACCURACY

### 2.5.1 Matrix Spike Recovery

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must generally fall within the range of 75 to 125 percent. Samples with a spike recovery of less than 30% and a sample value below the IDL were rejected and flagged "UR". All other samples with a spike recovery outside the QC limits are qualified as estimates and flagged "J".

The matrix spike recovery fell outside the QC limits and the associated results flagged "J" for arsenic in the following samples:

- All samples in SDG No. 9401L299.

The matrix spike recovery fell outside the QC limits and the associated results flagged "J" for lead in the following sample:

- Sample number B09W80 in SDG No. 9401L299.

The matrix spike recovery fell outside the QC limits and the associated results flagged "UJ" for lead in the following samples:

- All samples in SDG No. 9401L298.
- Sample numbers B09W78, B09W79, B09W81, B09W82 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W76, B09W77, B09W84, B09W85, B09W90 and B09W91 in SDG No. 9401L347.

41807 822676

~~The matrix spike recovery fell outside the QC limits and the associated results flagged "UJ" for mercury in the following sample:~~

- Sample number B09W92 in SDG No. B09W92.

The matrix spike recovery fell outside the QC limits and the associated results flagged "UJ" for selenium in the following samples:

- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

~~The matrix spike recovery fell outside the QC limits and the associated results flagged "UJ" for thallium in the following samples:~~

- Sample numbers B09W68, B09W69, B09WF1 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

All other matrix spike recovery results were acceptable.

## 2.5.2 Laboratory Control Sample Recovery

~~The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested or distilled and analyzed with every group of samples which have been prepared together. The performance criteria for solid LCS samples are established through interlaboratory studies coordinated by a certifying agency (e.g., EPA or an independent commercial supplier).~~

One liquid LCS was digested and analyzed for each of the cases in this report that contained water samples. The results were compared against the control limit of 80-120% as required by the EPA CLP SOW 3/90 protocol and found to be acceptable.

All LCSW results were found to be acceptable.

## 2.6 PRECISION

### 2.6.1 Laboratory Duplicate Samples

The laboratory duplicate results measures the precision of the method by measuring a second aliquot of the sample that is treated the same way as the original. Samples whose precision fell outside the quality control requirements were flagged as estimates "J".

9402L462

The laboratory duplicate results fell outside the QC limits and the associated results flagged "J" for calcium in the following samples:

- Sample numbers B09W76, B09W77, B09W85, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

The laboratory duplicate results fell outside the QC limits and the associated results flagged "UJ" for calcium in the following sample:

- Sample number B09W84 in SDG No. 9401L347.

The laboratory duplicate results fell outside the QC limits and the associated results flagged "J" for chromium in the following samples:

- All samples in SDG No. 9401L314.
- Sample numbers B09W76, B09W77, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

The laboratory duplicate results fell outside the QC limits and the associated results flagged "UJ" for chromium in the following samples:

- Sample numbers B09W84 and B09W85 in SDG No. 9401L347.

All other laboratory duplicate recovery results were acceptable.

#### 2.6.2 ICP Serial Dilution

The ICP serial dilution is used to determine whether significant physical or chemical interferences exist due to sample matrix. If sample concentration is  $\geq 50$  times the IDL for an analyte and the %D is outside the control limits the associated data must be qualified as estimates "J".

The ICP serial dilution results fell outside the QC limits and the associated results flagged "J" for calcium in the following samples:

- Sample numbers B09W92 and B09W93 in SDG No. B09W92.
- All samples in SDG No. 9401L298.
- All samples in SDG No. 9401L314.

9401L347-0016

- Sample numbers B09W64, B09W65, B09W66 and B09W67 in SDG No. 9401L365.
- Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.
- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.
- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "UJ" for calcium in the following samples:

- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.
- Sample numbers B09W69 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "J" for chromium in the following samples:

- Sample number B09W95 in SDG No. B09W92.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "UJ" for iron in the following sample:

- Sample number B09W59 in SDG No. 9402L462.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "J" for iron in the following sample:

- Sample number B09W58 in SDG No. 9402L462.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "J" for magnesium in the following samples:

- Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.
- All samples in SDG No. 9401L298.
- All samples in SDG No. 9401L314.
- Sample numbers B09W64, B09W65, B09W66 and B09W67 in SDG No. 9401L365.
- Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.
- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.



- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

The ICP serial dilution results fell outside the QC limits and the associated results flagged "UJ" for magnesium in the following samples:

- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.
- Sample numbers B09W69 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

~~The ICP serial dilution results fell outside the QC limits and the associated results flagged "J" for sodium in the following samples:~~

- All samples in SDG No. 9401L298.
- All samples in SDG No. 9401L314.
- Sample numbers B09W64, B09W65, B09W66 and B09W67 in SDG No. 9401L365.
- ~~Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.~~
- ~~Sample numbers B09W62 and B09W63 in SDG No. 9401L441.~~
- ~~Sample numbers B09W60 and B09W61 in SDG No. 9402L458.~~
- ~~Sample numbers B09W58 and B09W59 in SDG No. 9402L462.~~

The ICP serial dilution results fell outside the QC limits and the associated results flagged "UJ" for sodium in the following samples:

- Sample numbers B09W96 and B09W97 in SDG No. 9401L365.
- Sample numbers B09W69 and B09WF2 in SDG No. 9401L391.
- Sample numbers B09W86 and B09W87 in SDG No. 9402L458.

All other ICP serial dilution results were acceptable.

### 2.6.3 Total and Dissolved Sample Analysis

Inorganics parameters included the analysis of the total as well as dissolved samples. Total samples include particulate and dissolved fractions while dissolved samples are first filtered prior to preparation. The purpose of the analysis is to determine what metals are inherent in the particulate matter found in the aqueous sample.

Since Westinghouse Validation Guidelines do not address this issue, the total and dissolved samples are presented in the report, but no judgement on the data was made.

Below is a table of the total and filtered samples which were validated.

<u>Total</u>	<u>Filtered</u>
B09W42	B09W43
B09W44	B09W45
B09W46	B09W47
B09W48	B09W49
B09W50	B09W51
B09W52	B09W53
B09W54	B09W55
B09W56	B09W57
B09W58	B09W59
B09W60	B09W61
B09W62	B09W63
B09W64	B09W65
B09W66	B09W67
B09W68	B09W69
B09W70	B09W71
B09W72	B09W73
B09W74	B09W75
B09W76	B09W77
B09W78	B09W79
B09W80	B09W81
B09W82	B09W83
B09W84	B09W85
B09W86	B09W87
B09W88	B09W89
B09W90	B09W91
B09W92	B09W93
B09W94	B09W95
B09W96	B09W97
B09WF1	B09WF2

The following filtered results exceeded the total results with a percent difference greater than 50.0:

- Chromium, magnesium and sodium in sample numbers B09W56 and B09W57 in SDG No. 9401L314.
- Iron in sample numbers B09W66 and B09W67 in SDG No. 9401L365.

No qualification of the samples was made as per Westinghouse-Hanford data validation guidelines.

## 2.7 FURNACE AA QUALITY CONTROL

The post-digestion analytical spike is analyzed to determine the extent of interference in the digestate matrix. When the results of the analytical spike analyses exceeds the control window of 85 to 115 percent recovery and the absorbance of the sample is greater than fifty percent of the analytical spike absorbance, then the sample must be reanalyzed using the MSA. The duplicate injections and the analytical spike recoveries establish the precision and accuracy of the individual GFAA determinations.

### 2.7.1 Duplicate Injections

Each furnace analysis requires a minimum of two injections (burns), except for full Method of Standard Addition (MSA). For concentrations greater than CRDL, the duplicate injection readings must agree within 20% relative standard deviation (RSD) or coefficient of variation (CV). If these requirements are not met, the analytical sample must be rerun once (i.e., two additional burns). If the readings are then still outside the QC limits, the result is qualified as an estimate and flagged "J".

All duplicate injection quality control requirements were met.

### 2.7.2 Analytical Spike Recoveries

For all samples whose analytical spike results are outside the 85 to 115 percent control limit, but whose absorbances are less than 50 percent of the analytical spike absorbance, the samples were flagged as estimates "J".

The analytical spike recovery fell outside the established QC limits and the associated results flagged "UJ" for arsenic in the following sample:

- Sample number B09W71 in SDG No. 9401L314.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "J" for arsenic in the following samples:

- Sample numbers B09W81, B09W82 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W54 and B09W70 in SDG No. 9401L314.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "UJ" for lead in the following samples:

- Sample numbers B09W43, B09W46, B09W47, B09W48 and B09W49 in SDG No. 9401L298.

9401L298

- Sample numbers B09W78, B09W79, B09W81, B09W82 and B09W83 in SDG No. 9401L299.
- Sample numbers B09W76, B09W77, B09W84, B09W85, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W68 and B09WF1 in SDG No. 9401L391.
- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.
- Sample number B09W59 in SDG No. 9402L462.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "J" for lead in the following sample:

- Sample number B09W80 in SDG No. 9401L299.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "UJ" for selenium in the following samples:

- Sample numbers B09W43, B09W46, B09W48 and B09W49 in SDG No. 9401L298.
- Sample numbers B09W76, B09W77, B09W90 and B09W91 in SDG No. 9401L347.
- Sample numbers B09W60 and B09W61 in SDG No. 9402L458.
- Sample numbers B09W58 and B09W59 in SDG No. 9402L462.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "J" for selenium in the following samples:

- Sample numbers B09W80 and B09W81 in SDG No. 9401L299.

The analytical spike recovery fell outside the established QC limits and the associated results flagged "UJ" for thallium in the following samples:

- Sample number B09W79 in SDG No. 9401L299.
- Sample numbers B09W45, B09W51, B09W52, B09W70, B09W88 and B09W89 in SDG No. 9401L314.
- Sample number B09W68 in SDG No. 9401L391.
- Sample numbers B09W62 and B09W63 in SDG No. 9401L441.
- Sample number B09W58 in SDG No. 9402L462.
- Sample number B09W60 in SDG No. 9402L458.

9403278-0821

control (85-115%), the spiking solution must be verified by rerunning the preparation blank once. If the preparation blank analytical spike recovery is still out of control, correct the problem and reanalyze all analytical samples associated with the blank." In order to be consistent and accurate, this preparation blank must be analyzed within the same run. To recalibrate the instrument and reanalyze the preparation blank (on a different day) without analyzing all associated samples does not accurately verify the spiking solution results.

For thallium in SDG No. 9402L462, the laboratory ran two separate analyses. The first run included the preparation blank and all associated samples. The preparation blank recovery was 76%. The laboratory then recalibrated the instrument and ran the preparation blank (2X) with recoveries of 74.0% and 94.0%, respectively. The second run included only sample numbers B09W58D and B09W59.

The laboratory failed to verify the analytical spike solution for the preparation blank by not reanalyzing it within the first calibration. This affects sample number B09W58, which was reported from results in the first analyses. As a result, the thallium result for sample number B09W58 has been qualified as estimated and flagged "UJ" due to the preparation blank analytical spike out of control.

All other analytical spike recovery results were acceptable.

### 2.7.3 Method of Standard Addition (MSA) Results

For all samples whose analytical spike results are outside the 85 to 115 percent control limit and whose absorbances are greater than 50 percent of the analytical spike absorbance an MSA is required. In cases where the MSA correlation coefficient was less than 0.995 the MSA analysis was repeated once. If the correlation coefficient was still less than 0.995, samples were flagged as estimates "J".

All MSA results were acceptable.

### 2.8 ANALYTE QUANTITATION AND DETECTION LIMITS

Twenty percent of sample results and reported detection limits were recalculated to ensure that the reported results were accurate. Raw data were examined for anomalies, transcription errors, and reduction errors.

Thallium results for sample number B09W59 in SDG No. 9402L462 were run at a 10X dilution because the %RSD for the analytical spike was at 105%. The 10X dilution increased the IDL from 2 ug/L to 20 ug/L. The CRDL is 10 ug/L. The laboratory should have analyzed the sample at an initial dilution of 5X to

2287-3128-16  
944278-1822

from 2 ug/L to 20 ug/L. The CRDL is 10 ug/L. The laboratory should have analyzed the sample at an initial dilution of 5X to try and keep the IDL at the CRDL. However, this did not affect the usability of the data.

The reviewer verified that the results and detection limits fell within the linear range of the instrument.

## 2.9 OVERALL ASSESSMENT AND SUMMARY

All samples were analyzed and reported under the 1990 CLP protocol (EPA 1990). The metals analysis showed minor matrix spike accuracy problems, analytical spike problems, lab duplicate precision problems and ICP serial dilution problems were below the QC limit. Approximately 20 percent of the metals results were flagged "J" due to these factors. Both positive and negative laboratory blank contamination was noted in the inorganics analysis. Associated results were flagged accordingly. Contamination, however, was not sufficiently high to affect the usability of the data. Data qualified as estimated "J" are usable for limited purposes only. Except as noted above and in the preceding sections, all other validated data are usable for all purposes.

941327B.0823

Except as noted in the preceding sections, all other validated data are usable for all purposes.

9413278.0024

94-3278-0025

INORGANIC ANALYSIS, WATER MATRIX, (µg/L)

Page 1 of 1

[illegible]

WHC-SD-EN-TI-266, Rev. 0



## BLANK AND SAMPLE DATA SUMMARY

WHC-SD-EN-TI-266, Rev. 0

### ACCURACY DATA SUMMARY

[illegible]

### PRECISION DATA SUMMARY

[illegible]



9443273.0860

[illegible]

WHC-SD-EN-TI-266, Rev. 0

94-3278-0031

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

## PRECISION DATA SUMMARY

2-27

[illegible]



[illegible]

94-3272-0935

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

## BLANK AND SAMPLE DATA SUMMARY

2-31

94/3279.0837

----- This page left blank intentionally.

[illegible]

WHC-SD-EN-TI-266, Rev. 0

## Page 1 of 1

2-34

NA = Not Analyzed, FIL = Filtered

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

94-1270-0941

## BLANK AND SAMPLE DATA SUMMARY

[illegible]



94-3278-0842

### PRECISION DATA SUMMARY

[illegible]



WHC-SD-EN-TI-266, Rev. 0

NA = Not Analyzed FIL = Filtered

## HOLDING TIME SUMMARY

[illegible]

9413278.0846

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L298	REVIEWER: HMS				DATE: 4/18/94			PAGE 1 OF 1	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
PB	Aluminum	-18			ug/L	90.0	180.0	B09W42, B09W43, B09W46, B09W49	UJ
PB	Aluminum	-18			ug/L	90.0	180.0	B09W47, B09W48	J
CCB2	Antimony	29.1			ug/L	145.5	291.0	B09W47	U
CCB2	Cobalt	2.2			ug/L	11.0	22.0	B09W46, B09W47	U
CCB1	Iron	7.5			ug/L	37.5	75.0	B09W43	U
PB	Iron	7.0			ug/L	35.0	70.0	B09W49	U
CCB1	Vanadium	7.9			ug/L	39.5	79.0	B09W42, B09W43	U
CCB2	Vanadium	12.5			ug/L	62.5	125.0	B09W46, B09W47, B09W48, B09W49	U
PB	Zinc	5.2			ug/L	26.0	52.0	B09W42, B09W43, B09W46, B09W49	U

2-41

## ACCURACY DATA SUMMARY

SDG: 9401L298	REVIEWER: HMS	DATE: 4/18/94	PAGE 1 OF 1	
COMMENTS:				
SAMPLE ID	COMPOUND	% RECOVERY	SAMPLE(S) AFFECTED	QUALIFIER REQUIRED
B09W42S	Lead	67.5	All	UJ
B09W43A	Lead	79.1	B09W43	UJ
B09W46A	Lead	77.1	B09W46	UJ
B09W47A	Lead	74.9	B09W47	UJ
B09W48A	Lead	76.7	B09W48	UJ
B09W49A	Lead	71.7	B09W49	UJ
B09W43A	Selenium	79.8	B09W43	UJ
B09W46A	Selenium	77.4	B09W46	UJ
B09W48A	Selenium	82.1	B09W48	UJ
B09W49A	Selenium	84.1	B09W49	UJ

944 3273.0848

### PRECISION DATA SUMMARY

[illegible]

## DATA QUALIFICATION SUMMARY

SDG: 9401L298	REVIEWER: HMS	DATE: 4/18/94	PAGE 1 OF 1
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Aluminum	UJ	B09W42, B09W43, B09W46, B09W49	Negative Blank Contamination
Aluminum	J	B09W47, B09W48	Negative Blank Contamination
Antimony	U	B09W47	Lab Blank Contamination
Cobalt	U	B09W46, B09W47	Lab Blank Contamination
Iron	U	B09W43, B09W49	Lab Blank Contamination
Vanadium	U	B09W42, B09W43, B09W46, B09W47, B09W48, B09W49	Lab Blank Contamination
Zinc	U	B09W42, B09W43, B09W46, B09W49	Lab Blank Contamination
Mercury	UJ	All	Holding Times Exceeded
Lead	UJ	B09W43, B09W46, B09W47, B09W48, B09W49	GFAA Analytical Spike
Selenium	UJ	B09W43, B09W46, B09W48, B09W49	GFAA Analytical Spike
Calcium	J	All	ICP Serial Dilution
Magnesium	J	All	ICP Serial Dilution
Sodium	J	All	ICP Serial Dilution
Lead	UJ	All	Matrix Spike



911327A.0000

INORGANIC ANALYSIS, WATER MATRIX, (µg/L)

Page\_1\_of\_1\_

Project: WESTINGHOUSE - HANFORD																			
Laboratory: Roy F. Weston																			
Case		SDG: 9401L299																	
Sample Number		B09W78		B09W79		B09W80		B09W81		B09W82		B09W83							
Location		699-70-68		699-70-68		699-73-61		699-73-61		699-78-62		699-78-62							
Remarks				FIL				FIL				FIL							
Sample Date		01/12/94		01/12/94		01/12/94		01/12/94		01/12/94		01/12/94							
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	15.00	UJ	15.00	UJ	15.00	UJ	15.00	UJ	15.00	UJ	20.10	UJ						
Antimony	60	27.00	U	27.00	U	27.00	U	27.00	U	27.00	U	27.00	U						
Arsenic	10	8.70	J	5.90	J	2.70	J	3.60	J	5.30	J	5.00	J						
Barium	200	17.90	U	10.80	U	23.10		23.10		26.70		27.10							
Beryllium	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U						
Cadmium	5	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U						
Calcium	5000	34300		34500		36900		38200		41000		43000							
Chromium	10	3.00	U	3.70		10.40		8.90		40.40		41.50							
Cobalt	50	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ						
Copper	25	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ						
Iron	100	122.00		15.20	U	33.20	U	8.50	U	10.90	U	17.30	U						
Lead	3	2.00	UJ	2.00	UJ	2.10	J	2.00	UJ	2.00	UJ	2.00	UJ						
Magnesium	5000	9600		9330		9550		9820		11600		11900							
Manganese	15	3.00	U	3.00	U	6.90		6.90		3.00	U	3.00	U						
Mercury	0.2	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U						
Nickel	40	9.00	U	9.00	U	9.00	U	9.00	U	9.00	U	9.00	U						
Potassium	5000	4960	J	4840	J	4860	J	4840	J	4930	J	4730	J						
Selenium	5	2.60		2.00	U	3.00	J	2.60	J	2.80		2.20							
Silver	10	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U						
Sodium	5000	14700		14500		20100		20700		17700		17000							
Thallium	10	2.00	U	2.00	UJ	2.00	U	2.00	U	2.00	U	2.00	U						
Vanadium	50	17.20	UJ	12.70	UJ	9.80	UJ	11.50	UJ	18.80	UJ	23.60	UJ						
Zinc	20	12.00	U	7.20	U	146.00		21.10	U	93.40		6.40	U						
Cyanide	10	NA		NA		NA		NA		NA		NA							

WHC-SD-EN-TI-266, Rev. 0

2-45

NA = Not Analyzed FIL = Filtered

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L299		REVIEWER: SC			DATE: 4/15/94			PAGE 1 OF 2	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
PB	Aluminum	-16.0			ug/L	80.0	160.0	All	UJ
CCB1	Barium	4.0			ug/L	20.0	40.0	B09W78, B09W79	U
PB	Cobalt	-5.5			ug/L	27.5	55.0	All	UJ
PB	Copper	-2.0			ug/L	10.0	20.0	All	UJ
CCB1	Iron	14.2			ug/L	71.0	142.0	B09W79	U
CCB2	Iron	10.4			ug/L	52.0	104.0	B09W80, B09W81, B09W82	U
CCB3	Iron	12.8			ug/L	64.0	128.0	B09W83	U
PB	Potassium	-830			ug/L	4150	8300	All	J
CCB1	Vanadium	9.6			ug/L	48.0	96.0	B09W78, B09W79	U
CCB2	Vanadium	10.3			ug/L	51.5	103.0	B09W80, B09W81, B09W82	U
CCB	Vanadium	14.2			ug/L	71.0	142.0	B09W83	U
PB	Vanadium	-5.5			ug/L	27.5	55.0	All	UJ
PB	Zinc	7.9			ug/L	39.5	79.0	B09W78, B09W79, B09W81, B09W83	U

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

## ACCURACY DATA SUMMARY

SDG: 9401L299	REVIEWER: SC	DATE: 4/15/94	PAGE 1 OF 1	
COMMENTS:				
SAMPLE ID	COMPOUND	% RECOVERY	SAMPLE(S) AFFECTED	QUALIFIER REQUIRED
B09W78S	Arsenic	65.2	All	J
B09W78S	Lead	62.5	B09W80	J
B09W78S	Lead	62.5	B09W78, B09W79, B09W81, B09W82, B09W83	UJ
B09W81A	Arsenic	81.2	B09W81	J
B09W82A	Arsenic	81.3	B09W82	J
B09W83A	Arsenic	82.7	B09W83	J
B09W78A	Lead	84.5	B09W78	UJ
B09W79A	Lead	72.8	B09W79	UJ
B09W80A	Lead	77.1	B09W80	J
B09W81A	Lead	80.2	B09W81	UJ
B09W82A	Lead	73.3	B09W82	UJ
B09W83A	Lead	67.9	B09W83	UJ
B09W80A	Selenium	83.3	B09W80	J
B09W81A	Selenium	78.8	B09W81	J
B09W79A	Thallium	81.6	B09W79	UJ

## DATA QUALIFICATION SUMMARY

SDG: 9401L299	REVIEWER: SC	DATE: 4/15/94	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Barium	U	B09W78, B09W79	Lab Blank Contamination
Iron	U	B09W79, B09W80, B09W81, B09W82, B09W83	Lab Blank Contamination
Vanadium	U	All	Lab Blank Contamination
Zinc	U	B09W78, B09W79, B09W81, B09W83	Lab Blank Contamination
Aluminum	UJ	All	Negative Blank Contamination
Cobalt	UJ	All	Negative Blank Contamination
Copper	UJ	All	Negative Blank Contamination
Potassium	J	All	Negative Blank Contamination
Vanadium	UJ	All	Negative Blank Contamination
Arsenic	J	All	Matrix Spike
Lead	J	B09W80	Matrix Spike
Lead	UJ	B09W78, B09W79, B09W81, B09W82, B09W83	Matrix Spike
Arsenic	J	B09W81, B09W82, B09W83	GFAA Analytical Spike
Lead	UJ	B09W78, B09W79, B09W81, B09W82, B09W83	GFAA Analytical Spike
Lead	J	B09W80	GFAA Analytical Spike
Selenium	J	B09W80, B09W81	GFAA Analytical Spike
Thallium	UJ	B09W79	GFAA Analytical Spike

9401L299

9413278.0855

## INORGANIC ANALYSIS, WATER MATRIX, (µg/L)

Page 1 of 2

Project: WESTINGHOUSE-HANFORD																					
Laboratory: Roy F. Weston																					
Case		SDG: 9401L314																			
Sample Number		B09W44		B09W45		B09W50		B09W51		B09W52		B09W53		B09W54		B09W55		B09W56		B09W57	
Location		199-K-13		199-K-13		199-K-20		199-K-20		199-K-21		199-K-21		199-K-22		199-K-22		199-K-23		199-K-23	
Remarks		FIL		FIL		FIL		FIL		FIL		FIL		FIL		FIL		FIL		FIL	
Sample Date		01/12/94		01/12/94		01/13/94		01/13/94		01/13/94		01/13/94		01/13/94		01/13/94		01/13/94		01/13/94	
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	18.50		15.00	U	19.70		15.00	U	55.50		15.00	U	23.10		20.00		19.40		15.00	U
Antimony	60	27.00	U	27.00	U	27.00	UJ	27.00	U	27.00	U	27.00	U	27.00	UJ	27.00	UJ	27.00	UJ	27.00	UJ
Arsenic	10	6.10		5.60		3.40		3.30		2.00	U	2.00	U	2.00	J	2.00	U	2.00	U	5.10	
Barium	200	24.70		23.90		25.10		24.30		18.40	U	17.20	U	19.60	U	19.60	U	32.50		37.20	
Beryllium	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Cadmium	5	3.00	U	3.00	U	3.00	UJ	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U
Calcium	5000	39600	J	38500	J	41300	J	40500	J	42200	J	41800	J	37000	J	37500	J	49800	J	60600	J
Chromium	10	19.40	J	17.50	J	157.00	J	147.00	J	105.00	J	88.60	J	148.00	J	131.00	J	15.30	J	40.00	J
Cobalt	50	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Copper	25	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	4.50	U	2.00	U	4.10	U
Iron	100	64.50		10.20	U	139.00		12.90	U	304.00		12.90	U	144.00		77.30		57.50	U	22.60	U
Lead	3	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Magnesium	5000	9950	J	9670	J	8530	J	8290	J	8090	J	7980	J	6710	J	6700	J	9420	J	15700	J
Manganese	15	3.00	U	3.00	U	3.10		3.00	U	9.20		3.00	U	4.10		3.00	U	3.10		3.10	
Mercury	0.2	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ
Nickel	40	12.00		9.00	U	11.10		9.00	U	13.30		12.40		12.40		16.40		9.00	U	9.00	U
Potassium	5000	5840		5150		3900		3710		1870		1630		2230		2660		3370		10200	
Selenium	5	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ
Silver	10	3.00	U	3.00	U	6.90		3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U
Sodium	5000	18000	J	17500	J	5000	J	4850	J	3520	J	3500	J	6290	J	6050	J	15500	J	24400	J
Thallium	10	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ
Vanadium	50	12.70	UJ	13.00	UJ	6.10	UJ	5.70	UJ	4.00	UJ	4.00	UJ	4.00	UJ	4.00	UJ	4.00	UJ	17.60	UJ
Zinc	20	25.60		8.40	U	9.70	U	7.10	U	20.30	U	19.90	U	351.00		74.70		11.00	U	8.80	U
Cyanide	10	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

WMC-SD-EN-TI-266, Rev. 0

Project: WESTINGHOUSE-HANFORD																					
Laboratory: Roy F. Weston																					
Case		SDG: 9401L314																			
Sample Number		B09W70		B09W71		B09W72		B09W73		B09W74		B09W75		B09W88		B09W89					
Location		199-K-34		199-K-34		199-K-35		199-K-35		199-K-36		199-K-36		199-K-35		199-K-35					
Remarks				FIL				FIL				FIL		DUP		DUP,FIL					
Sample Date		01/13/94		01/13/94		01/14/94		01/14/94		01/14/94		01/14/94		01/14/94		01/14/94					
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	677.00		15.90		21.40		15.00	U	39.30		15.00	U	48.90		15.00	U				
Antimony	60	27.00	U	27.00	UJ	27.00	UJ	27.00	UJ	27.00	U	27.00	UJ	27.00	U	27.00	U				
Arsenic	10	5.60	J	2.00	UJ	3.60		5.00		4.20		4.40		4.10		4.70					
Barium	200	43.50		32.90		33.30		32.50		44.30	U	46.60	U	37.20	U	31.30	U				
Beryllium	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U				
Cadmium	5	3.00	UJ	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U				
Calcium	5000	54100	J	48900	J	36900	J	35800	J	41800	J	44800	J	36900	J	35100	J				
Chromium	10	89.80	J	15.10	J	24.40	J	16.00	J	112.00	J	116.00	J	46.70	J	10.80	J				
Cobalt	50	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.70	U	2.00	U				
Copper	25	18.40		2.00	U	2.00	U	2.00	U	2.00		2.00	U	4.50		2.00	U				
Iron	100	4920		23.40	U	88.10		18.30	U	90.20		10.50	U	230.00		20.90	U				
Lead	3	2.20		2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.60					
Magnesium	5000	14000	J	9240	J	10100	J	9750	J	10200	J	10900	J	10000	J	9510	J				
Manganese	15	72.80		3.00	U	3.10		3.00	U	3.10		3.00	U	10.30		3.00	U				
Mercury	0.2	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ				
Nickel	40	19.10		10.20		11.60		9.00	U	12.40		12.00		24.90		9.00	U				
Potassium	5000	9050		3540		5410		5480		5190		5910		5580		5430					
Selenium	5	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ				
Silver	10	3.00	U	3.00	U	3.00	U	5.30		13.40		3.00	U	3.00	U	3.00	U				
Sodium	5000	21800	J	14700	J	13800	J	13300	J	13400	J	14200	J	13800	J	13100	J				
Thallium	10	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ				
Vanadium	50	12.00	UJ	4.00	UJ	10.80	UJ	12.40	UJ	4.00	UJ	4.60	UJ	8.70	UJ	7.80	UJ				
Zinc	20	132.00		5.70	U	13.70	U	9.70	U	26.90		9.70	U	9.60	U	13.70	U				
Cyanide	10	NA		NA		NA		NA		NA		NA		NA		NA					

DUP = Duplicate, NA = Not Analyzed, FIL = Filtered

WHC-SD-EN-TI-266, Rev. 0

## HOLDING TIME SUMMARY

SDG: 9401L314		REVIEWER: SC			DATE: 4/13/94		PAGE 1 OF 2	
COMMENTS:								
FIELD SAMPLE ID	ANALYSIS TYPE	DATE SAMPLED	DATE PREPARED	DATE ANALYZED	PREP. HOLDING TIME, DAYS	ANALYSIS HOLDING TIME, DAYS	QUALIFIER	
B09W44	Mercury	1/12/94	2/14/94	2/15/94		28	UJ	
B09W45	Mercury	1/12/94	2/14/94	2/15/94		28	UJ	
B09W50	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W51	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W52	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W53	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W54	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W55	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W56	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W57	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W70	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W71	Mercury	1/13/94	2/14/94	2/15/94		28	UJ	
B09W72	Mercury	1/14/94	2/14/94	2/15/94		28	UJ	
B09W73	Mercury	1/14/94	2/14/94	2/15/94		28	UJ	
B09W74	Mercury	1/14/94	2/14/94	2/15/94		28	UJ	
B09W75	Mercury	1/14/94	2/14/94	2/15/94		28	UJ	



94-3278-0850

## HOLDING TIME SUMMARY

[illegible]

9413278.0859

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L314		REVIEWER: SC			DATE: 4/13/94			PAGE 1 OF 3	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
CCB3	Barium	3.9			ug/L	19.5	39.0	B09W52, B09W53	U
CCB2	Copper	2.0			ug/L	10.0	20.0	B09W54, B09W55, B09W57, B09W71	U
CCB1	Iron	7.3			ug/L	36.5	73.0	B09W89	U
CCB3	Iron	6.7			ug/L	33.5	67.0	B09W57, B09W71, B09W73, B09W75	U
PB	Iron	12.9			ug/L	64.5	129.0	B09W45, B09W51, B09W53, B09W56, B09W57, B09W71, B09W73, B09W75, B09W89	U
PB	Selenium				ug/L	13.5	27.0	All	UJ
PB	Thallium	-2.8			ug/L	14.0	28.0	All	UJ
CCB1	Vanadium	5.4			ug/L	27.0	54.0	B09W88, B09W89	U
CCB2	Vanadium	5.9			ug/L	29.5	59.0	B09W50, B09W57, B09W70, B09W72, B09W73, B09W75	U

9413278.0860

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L314		REVIEWER: SC			DATE: 4/13/94			PAGE 2 OF 3	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
CCB3	Vanadium	10.0			ug/L	50.0	100.0	B09W44, B09W45, B09W51	U
PB	Vanadium	-12.0			ug/L	60.0	120.0	All	UJ
PB	Zinc	4.8			ug/L	24.0	48.0	B09W45, B09W50, B09W51, B09W52, B09W53, B09W56, B09W57, B09W71, B09W72, B09W73, B09W75, B09W88, B09W89	U

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L314		REVIEWER: SC			DATE: 4/13/94			PAGE 3 OF 3	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	2X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
CCB2	Antimony	-28.0			ug/L	56.0	280.0	B09W50, B09W54, B09W55, B09W56, B09W57, B09W71, B09W72, B09W73, B09W75	UJ
CCB1	Selenium	-2.6			ug/L	5.2	26.0	B09W88	UJ
CCB2	Selenium	-2.2			ug/L	4.4	22.0	B09W72, B09W74, B09W75, B09W89	UJ
CCB3	Selenium	-2.3			ug/L	4.6	23.0	B09W56, B09W57, B09W70, B09W71, B09W73	UJ
CCB4	Selenium	-2.0			ug/L	4.0	20.0	B09W53	UJ
CCB1	Thallium	-2.4			ug/L	4.8	24.0	B09W51, B09W57, B09W73	UJ

9413278.0862

## ACCURACY DATA SUMMARY

SDG: 9401L314	REVIEWER: SC	DATE: 4/13/94	PAGE 1 OF 1	
COMMENTS:				
SAMPLE ID	COMPOUND	% RECOVERY	SAMPLE(S) AFFECTED	QUALIFIER REQUIRED
B09W54A	Arsenic	81%	B09W54	J
B09W70A	Arsenic	119.5%	B09W70	J
B09W71A	Arsenic	122%	B09W71	UJ
B09W45A	Thallium	84.4%	B09W45	UJ
B09W51A	Thallium	80.1%	B09W51	UJ
B09W52A	Thallium	66%	B09W52	UJ
B09W70A	Thallium	80.3%	B09W70	UJ
B09W88A	Thallium	76%	B09W88	UJ
B09W89A	Thallium	81.2%	B09W89	UJ

91-3278-0866

### PRECISION DATA SUMMARY

[illegible]

## DATA QUALIFICATION SUMMARY

SDG: 9401L314	REVIEWER: SC	DATE: 4/14/94	PAGE 1 OF 1
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Mercury	UJ	All	Holding Times Exceeded
Barium	U	B09W52, B09W53	Lab Blank Contamination
Copper	U	B09W54, B09W55, B09W57, B09W71	Lab Blank Contamination
Iron	U	B09W45, B09W51, B09W53, B09W56, B09W57, B09W71, B09W73, B09W75, B09W89	Lab Blank Contamination
Vanadium	U	B09W44, B09W45, B09W50, B09W51, B09W57, B09W70, B09W72, B09W73, B09W75, B09W88, B09W89	Lab Blank Contamination
Zinc	U	B09W45, B09W50, B09W51, B09W52, B09W53, B09W56, B09W57, B09W71, B09W72, B09W73, B09W75, B09W88, B09W89	Lab Blank Contamination
Antimony	UJ	B09W50, B09W54, B09W55, B09W56, B09W57, B09W71, B09W72, B09W73, B09W75	Negative Blank Contamination
Selenium	UJ	All	Negative Blank Contamination
Thallium	UJ	All	Negative Blank Contamination
Vanadium	UJ	All	Negative Blank Contamination
Arsenic	J	B09W54, B09W70	GFAA Analytical Spike
Arsenic	UJ	B09W71	GFAA Analytical Spike
Thallium	UJ	B09W45, B09W51, B09W52, B09W70, B09W88, B09W89	GFAA Analytical Spike
Chromium	J	All	Lab Duplicate
Calcium	J	All	ICP Serial Dilution
Magnesium	J	All	ICP Serial Dilution
Sodium	J	All	ICP Serial Dilution

WHC-SD-EN-TI-266, Rev. 0

## Page 1 of 1

[illegible]

EB = Equipment Blank, DUP = Duplicate, NA = Not Analyzed

2-60



## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L347	REVIEWER: RJS				DATE: 4/19/94			PAGE 1 OF 3	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
CCB2	Barium	7.0			ug/L	35.0	70.0	B09W76, B09W77	U
CCB3	Barium	7.4			ug/L	37.0	74.0	B09W85, B09W90, B09W91	U
CCB2	Calcium	38.1			ug/L	190.5	381.0	B09W84	U
PB	Calcium	33.3			ug/L	166.5	333.0	B09W84	U
CCB2	Cobalt	4.5			ug/L	22.5	45.0	B09W76	U
CCB2	Iron	14.8			ug/L	74.0	148.0	B09W76, B09W77, B09W84	U
CCB3	Iron	13.6			ug/L	68.0	136.0	B09W85, B09W90, B09W91	U
PB	Iron	22.9			ug/L	114.5	229.0	All	U
CCB2	Sodium	95.7			ug/L	478.5	957.0	B09W84	U
CCB3	Sodium	132.1			ug/L	660.5	1321	B09W85	U
CCB2	Vanadium	9.6			ug/L	48.0	96.0	B09W76, B09W77	U
CCB3	Vanadium	12.8			ug/L	64.0	128.0	B09W90, B09W91	U
PB	Vanadium	4.7			ug/L	23.5	47.0	All	UJ
CCB2	Zinc	3.2			ug/L	16.0	32.0	B09W76, B09W77, B09W84	U

## BLANK AND SAMPLE DATA SUMMARY

WHC-SD-EN-TI-266, Rev. 0

## BLANK AND SAMPLE DATA SUMMARY

2-63

## ACCURACY DATA SUMMARY

SDG: 9401L347	REVIEWER: RJS	DATE: 4/19/94	PAGE 1 OF 1	
COMMENTS:				
SAMPLE ID	COMPOUND	% RECOVERY	SAMPLE(S) AFFECTED	QUALIFIER REQUIRED
B09W76A	Lead	71.2	B09W76	UJ
B09W77A	Lead	72.2	B09W77	UJ
B09W84A	Lead	122.3	B09W84	UJ
B09W85A	Lead	122.9	B09W85	UJ
B09W90A	Lead	69.6	B09W90	UJ
B09W91A	Lead	66.4	B09W91	UJ
B09W76A	Selenium	76.5	B09W76	UJ
B09W77A	Selenium	74.0	B09W77	UJ
B09W90A	Selenium	73.3	B09W90	UJ
B09W91A	Selenium	79.0	B09W91	UJ
B09W76S	Lead	59.0	B09W76, B09W77, B09W84, B09W85, B09W90, B09W91	UJ

947327B.0870

### PRECISION DATA SUMMARY

[illegible]

## DATA QUALIFICATION SUMMARY

SDG: 9401L347	REVIEWER: RJS	DATE: 4/19/94	PAGE 1 OF 1
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Barium	U	B09W76, B09W77, B09W85, B09W90, B09W91	Lab Blank Contamination
Calcium	U	B09W84	Lab Blank Contamination
Cobalt	U	B09W76	Lab Blank Contamination
Iron	U	All	Lab Blank Contamination
Sodium	U	B09W84, B09W85	Lab Blank Contamination
Vanadium	U	B09W76, B09W77, B09W90, B09W91	Lab Blank Contamination
Zinc	U	B09W76, B09W77, B09W84, B09W90, B09W91	Lab Blank Contamination
Lead	UJ	B09W85, B09W90, B09W91	Negative Blank Contamination
Vanadium	UJ	All	Negative Blank Contamination
Lead	UJ	B09W76, B09W77, B09W84, B09W85, B09W90, B09W91	GFAA Analytical Spike
Selenium	UJ	B09W76, B09W77, B09W90, B09W91	GFAA Analytical Spike
Lead	UJ	All	Matrix Spike
Calcium	J	B09W76, B09W77, B09W85, B09W90, B09W91	Lab Duplicate
Calcium	UJ	B09W84	Lab Duplicate
Chromium	J	B09W76, B09W77, B09W90, B09W91	Lab Duplicate
Chromium	UJ	B09W84, B09W85	Lab Duplicate

180 3/25/16 9473273.0871

Project: WESTINGHOUSE-HANFORD																			
Laboratory: Roy F. Weston																			
Case		SDG: 9401L365																	
Sample Number		B09W64		B09W65		B09W66		B09W67		B09W96		B09W97							
Location		199-K-32A		199-K-32A		199-K-32B		199-K-32B		TB-1		TB-1							
Remarks				FIL				FIL		TB		TB, FIL							
Sample Date		01/18/94		01/18/94		01/18/94		01/18/94		01/18/94		01/18/94							
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	15.00	UJ	15.00	UJ	15.00	UJ	24.40	J	15.00	UJ	15.00	UJ						
Antimony	60	27.00	U	27.00	U	27.00	U	27.00	U	27.00	U	27.00	U						
Arsenic	10	2.20		2.00		2.00	U	2.90		2.00	U	2.00	U						
Barium	200	23.50	U	27.60	U	65.10		79.10		3.00	U	3.00	U						
Beryllium	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U						
Cadmium	5	3.00	U	3.00	U	3.00	U	3.60		3.00	U	3.00	U						
Calcium	5000	39300	J	43200	J	23500	J	27500	J	77.90	UJ	36.20	UJ						
Chromium	10	22.90		22.90		9.00		16.10		3.00	U	3.00	U						
Cobalt	50	2.00	U	2.00	U	2.00	U	6.70	U	2.00	U	2.00	U						
Copper	25	3.00	U	2.60	U	2.00	U	8.20	U	2.00	U	2.00	U						
Iron	100	39.30		8.30		43.90		123.00		11.60		7.60							
Lead	3	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U						
Magnesium	5000	4570	J	4980	J	13700	J	15900	J	47.00	UJ	47.00	UJ						
Manganese	15	3.00	U	3.00	U	3.00	U	22.90		3.00	U	3.00	U						
Mercury	0.2	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ						
Nickel	40	9.00	U	9.00	U	9.00	U	17.90		10.20		9.00	U						
Potassium	5000	2070		2370		4710		5540		666.00	U	666.00	U						
Selenium	5	2.00	U	2.00	U	2.40		2.00	U	2.00	U	2.00	U						
Silver	10	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U						
Sodium	5000	5930	J	6540	J	26300	J	31500	J	27.00	UJ	27.00	UJ						
Thallium	10	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U						
Vanadium	50	4.00	UJ	4.00	UJ	4.00	UJ	4.00	UJ	4.00	UJ	4.00	UJ						
Zinc	20	14.20	U	14.20	U	14.20	U	11.50	U	17.70		3.00	U						
Cyanide	10	NA		NA		NA		NA		NA		NA							
			</																

WHC-SD-EN-TI-266, Rev. 0

TB = Trip Blank, NA = Not Analyzed, FIL = Filtered

9413273.0875

## HOLDING TIME SUMMARY

[illegible]



9413278.0874

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9401L365		REVIEWER: LM			DATE: 4/25/94			PAGE 1 OF 2	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
PB	Aluminum	-19.0			ug/L	80.0	190.0	B09W64, B09W65, B09W66, B09W96, B09W97	UJ
PB	Aluminum	-19.0			ug/L	80.0	190.0	B09W67	J
CCB1	Barium	8.2			ug/L	41.0	82.0	B09W64	U
CCB2	Barium	7.8			ug/L	39.0	78.0	B09W65	U
CCB2	Calcium	44.4			ug/L	222.0	444.0	B09W96, B09W97	U
CCB1	Cobalt	4.0			ug/L	20.0	40.0	B09W67	U
CCB1	Copper	2.1			ug/L	10.5	21.0	B09W64, B09W67	U
CCB2	Copper	3.0			ug/L	15.0	30.0	B09W65	U
PB	Magnesium	-64.0			ug/L	320.0	640.0	B09W96, B09W97	UJ
PB	Sodium	-90.0			ug/L	450.0	900.0	B09W96, B09W97	UJ
PB	Vanadium	-11.0			ug/L	55.0	110.0	All	UJ
PB	Zinc	3.5			ug/L	17.5	35.0	B09W64, B09W65, B09W66, B09W67	U

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

### PRECISION DATA SUMMARY

[illegible]

## DATA QUALIFICATION SUMMARY

SDG: 9401L365	REVIEWER: LM	DATE: 4/25/94	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Mercury	UJ	All	Holding Times Exceeded
Barium	U	B09W64, B09W65	Lab Blank Contamination
Calcium	U	B09W96, B09W97	Lab Blank Contamination
Cobalt	U	B09W67	Lab Blank Contamination
Copper	U	B09W64, B09W65, B09W67	Lab Blank Contamination
Zinc	U	B09W64, B09W65, B09W66, B09W67	Lab Blank Contamination
Aluminum	J	B09W67	Negative Blank Contamination
Aluminum	UJ	B09W64, B09W65, B09W66, B09W96, B09W97	Negative Blank Contamination
Magnesium	UJ	B09W96, B09W97	Negative Blank Contamination
Sodium	UJ	B09W96, B09W97	Negative Blank Contamination
Vanadium	UJ	All	Negative Blank Contamination
Calcium	J	B09W64, B09W65, B09W66, B09W67	ICP Serial Dilution
Calcium	UJ	B09W96, B09W97	ICP Serial Dilution
Magnesium	J	B09W64, B09W65, B09W66, B09W67	ICP Serial Dilution
Magnesium	UJ	B09W96, B09W97	ICP Serial Dilution
Sodium	J	B09W64, B09W65, B09W66, B09W67	ICP Serial Dilution
Sodium	UJ	B09W96, B09W97	ICP Serial Dilution

6413278.0877

[illegible]

WHC-SD-EN-TI-266, Rev. 0

TB = Trip Blank, NA = Not Analyzed, FIL = Filtered

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

### ACCURACY DATA SUMMARY

[illegible]

94-3275-088

### PRECISION DATA SUMMARY

[illegible]

WHC-SD-EN-TI-266, Rev. 0

2-76



[illegible]

94-3279-0003

## INORGANIC ANALYSIS, WATER MATRIX, (µg/L)

Page 1 of 1

Project: WESTINGHOUSE- HANFORD																					
Laboratory: Roy F. Weston																					
Case		SDG: 9401L441																			
Sample Number		B09W62		B09W63																	
Location		199-K-31		199-K-31																	
Remarks				FIL																	
Sample Date		01/24/94		01/24/94																	
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	26.20	U	15.00	U																
Antimony	60	27.00	U	27.00	U																
Arsenic	10	3.40		2.30																	
Barium	200	34.40		29.80																	
Beryllium	5	1.00	U	1.00	U																
Cadmium	5	3.00	U	3.00	U																
Calcium	5000	38100	J	37700	J																
Chromium	10	13.20	J	12.10	J																
Cobalt	50	2.90	U	2.00	U																
Copper	25	2.70		2.00	U																
Iron	100	78.40		9.30																	
Lead	3	2.00	U	2.00	U																
Magnesium	5000	8690		8560																	
Manganese	15	3.00	U	3.00	U																
Mercury	0.2	0.10	U	0.10	U																
Nickel	40	9.00	U	9.00	U																
Potassium	5000	4870	J	4370	J																
Selenium	5	2.00	U	2.00	U																
Silver	10	3.00	U	3.00	U																
Sodium	5000	14100	J	13900	J																
Thallium	10	20.00	UJ	2.00	UJ																
Vanadium	50	34.80	U	30.60	U																
Zinc	20	11.10	U	12.20	U																
Cyanide	10	NA		NA																	

WHC-SD-EN-TI-266, Rev. 0

NA = Not Analyzed, FIL = Filtered

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

## BLANK AND SAMPLE DATA SUMMARY

2-80

9113273.0886

## ACCURACY DATA SUMMARY

[illegible]

94-3278-0987

### PRECISION DATA SUMMARY

[illegible]

[illegible]

94-3272-0009

INORGANIC ANALYSIS, WATER MATRIX, (µg/L)

Page\_\_1\_\_ of \_\_1\_\_

[illegible]

WHC-SD-EN-TI-266, Rev. 0

2-84

EB = Equipment Blank, NA = Not Analyzed, FIL = Filtered



## HOLDING TIME SUMMARY

WHC-SD-EN-TI-266, Rev. 0

9413278.0891

## BLANK AND SAMPLE DATA SUMMARY

SDG: 9402L458	REVIEWER: RJS	DATE: 4/15/94						PAGE 1 OF 3	
COMMENTS:									
SAMPLE ID	COMPOUND	RESULT	Q	RT	UNITS	5X RESULT	10X RESULT	SAMPLES AFFECTED	QUALIFIER
CCB1	Aluminum	23.9			ug/L	119.5	239.0	B09W60	U
CCB1	Arsenic	2.1			ug/L	10.5	21.0	B09W60	U
CCB2	Arsenic	2.6			ug/L	13.0	26.0	B09W61	U
CCB2	Calcium	39.4			ug/L	197.0	394.0	B09W86, B09W87	U
CCB1	Iron	8.7			ug/L	43.5	87.0	B09W60	U
CCB2	Iron	6.5			ug/L	32.5	65.0	B09W61, B09W86, B09W87	U
PB	Iron	9.2			ug/L	46.0	92.0	B09W60, B09W61, B09W86, B09W87	U
CCB2	Magnesium	88.9			ug/L	444.5	889.0	B09W86, B09W87	U
PB	Magnesium	210.9			ug/L	1054.5	2109.0	B09W86, B09W87	U
PB	Potassium	-890			ug/L	4450.0	8900.0	B09W60, B09W61	J
PB	Potassium	-890			ug/L	4450.0	8900.0	B09W86, B09W87	UJ
CCB2	Sodium	91.2			ug/L	456.0	912.0	B09W86, B09W87	U
PB	Sodium	254.8			ug/L	1274.0	2548.0	B09W86, B09W87	U
CCB1	Vanadium	8.4			ug/L	42.0	84.0	B09W60	U
CCB2	Vanadium	10.1			ug/L	50.5	101.0	B09W61, B09W86, B09W87	U

## BLANK AND SAMPLE DATA SUMMARY

2-87

## BLANK AND SAMPLE DATA SUMMARY

[illegible]

### ACCURACY DATA SUMMARY

[illegible]

### PRECISION DATA SUMMARY

2-90

## DATA QUALIFICATION SUMMARY

SDG: 9402L458	REVIEWER: RJS	DATE: 4/15/94	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Mercury	UJ	B09W60, B09W61, B09W86, B09W87	Holding Times Exceeded
Aluminum	U	B09W60	Lab Blank Contamination
Arsenic	U	B09W60, B09W61	Lab Blank Contamination
Calcium	U	B09W86, B09W87	Lab Blank Contamination
Iron	U	B09W60, B09W61, B09W86, B09W87	Lab Blank Contamination
Magnesium	U	B09W86, B09W87	Lab Blank Contamination
Sodium	U	B09W86, B09W87	Lab Blank Contamination
Vanadium	U	B09W60, B09W61, B09W86, B09W87	Lab Blank Contamination
Zinc	U	B09W60, B09W61, B09W86, B09W87	Lab Blank Contamination
Nickel	UJ	B09W60	Negative Blank Contamination
Potassium	J	B09W60, B09W61	Negative Blank Contamination
Potassium	UJ	B09W86, B09W87	Negative Blank Contamination
Lead	UJ	B09W60, BC - 51	GFAA Analytical Spike
Selenium	UJ	B09W60, B09W61	GFAA Analytical Spike
Thallium	UJ	B09W60	GFAA Analytical Spike
Calcium	J	B09W60, B09W61	ICP Serial Dilution
Calcium	UJ	B09W86, B09W87	ICP Serial Dilution
Magnesium	J	B09W60, B09W61	ICP Serial Dilution
Magnesium	UJ	B09W86, B09W87	ICP Serial Dilution
Sodium	J	B09W60, B09W61	ICP Serial Dilution
Sodium	UJ	B09W86, B09W87	ICP Serial Dilution

9402L458

WHC-SD-EN-TI-266, Rev. 0

## Page\_1\_ of \_1\_

NA = Not Analyzed, FIL = Filtered



741 327E-0890

## HOLDING TIME SUMMARY

[illegible]

## BLANK AND SAMPLE DATA SUMMARY

2-94

### ACCURACY DATA SUMMARY

2-95

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100  
101  
102  
103  
104  
105  
106  
107  
108  
109  
110  
111  
112  
113  
114  
115  
116  
117  
118  
119  
120  
121  
122  
123  
124  
125  
126  
127  
128  
129  
130  
131  
132  
133  
134  
135  
136  
137  
138  
139  
140  
141  
142  
143  
144  
145  
146  
147  
148  
149  
150  
151  
152  
153  
154  
155  
156  
157  
158  
159  
160  
161  
162  
163  
164  
165  
166  
167  
168  
169  
170  
171  
172  
173  
174  
175  
176  
177  
178  
179  
180  
181  
182  
183  
184  
185  
186  
187  
188  
189  
190  
191  
192  
193  
194  
195  
196  
197  
198  
199  
200  
201  
202  
203  
204  
205  
206  
207  
208  
209  
210  
211  
212  
213  
214  
215  
216  
217  
218  
219  
220  
221  
222  
223  
224  
225  
226  
227  
228  
229  
230  
231  
232  
233  
234  
235  
236  
237  
238  
239  
240  
241  
242  
243  
244  
245  
246  
247  
248  
249  
250  
251  
252  
253  
254  
255  
256  
257  
258  
259  
260  
261  
262  
263  
264  
265  
266  
267  
268  
269  
270  
271  
272  
273  
274  
275  
276  
277  
278  
279  
280  
281  
282  
283  
284  
285  
286  
287  
288  
289  
290  
291  
292  
293  
294  
295  
296  
297  
298  
299  
300  
301  
302  
303  
304  
305  
306  
307  
308  
309  
310  
311  
312  
313  
314  
315  
316  
317  
318  
319  
320  
321  
322  
323  
324  
325  
326  
327  
328  
329  
330  
331  
332  
333  
334  
335  
336  
337  
338  
339  
340  
341  
342  
343  
344  
345  
346  
347  
348  
349  
350  
351  
352  
353  
354  
355  
356  
357  
358  
359  
360  
361  
362  
363  
364  
365  
366  
367  
368  
369  
370  
371  
372  
373  
374  
375  
376  
377  
378  
379  
380  
381  
382  
383  
384  
385  
386  
387  
388  
389  
390  
391  
392  
393  
394  
395  
396  
397  
398  
399  
400  
401  
402  
403  
404  
405  
406  
407  
408  
409  
410  
411  
412  
413  
414  
415  
416  
417  
418  
419  
420  
421  
422  
423  
424  
425  
426  
427  
428  
429  
430  
431  
432  
433  
434  
435  
436  
437  
438  
439  
440  
441  
442  
443  
444  
445  
446  
447  
448  
449  
450  
451  
452  
453  
454  
455  
456  
457  
458  
459  
460  
461  
462  
463  
464  
465  
466  
467  
468  
469  
470  
471  
472  
473  
474  
475  
476  
477  
478  
479  
480  
481  
482  
483  
484  
485  
486  
487  
488  
489  
490  
491  
492  
493  
494  
495  
496  
497  
498  
499  
500  
501  
502  
503  
504  
505  
506  
507  
508  
509  
510  
511  
512  
513  
514  
515  
516  
517  
518  
519  
520  
521  
522  
523  
524  
525  
526  
527  
528  
529  
530  
531  
532  
533  
534  
535  
536  
537  
538  
539  
540  
541  
542  
543  
544  
545  
546  
547  
548  
549  
550  
551  
552  
553  
554  
555  
556  
557  
558  
559  
560  
561  
562  
563  
564  
565  
566  
567  
568  
569  
570  
571  
572  
573  
574  
575  
576  
577  
578  
579  
580  
581  
582  
583  
584  
585  
586  
587  
588  
589  
590  
591  
592  
593  
594  
595  
596  
597  
598  
599  
600  
601  
602  
603  
604  
605  
606  
607  
608  
609  
610  
611  
612  
613  
614  
615  
616  
617  
618  
619  
620  
621  
622  
623  
624  
625  
626  
627  
628  
629  
630  
631  
632  
633  
634  
635  
636  
637  
638  
639  
640  
641  
642  
643  
644  
645  
646  
647  
648  
649  
650  
651  
652  
653  
654  
655  
656  
657  
658  
659  
660  
661  
662  
663  
664  
665  
666  
667  
668  
669  
670  
671  
672  
673  
674  
675  
676  
677  
678  
679  
680  
681  
682  
683  
684  
685  
686  
687  
688  
689  
690  
691  
692  
693  
694  
695  
696  
697  
698  
699  
700  
701  
702  
703  
704  
705  
706  
707  
708  
709  
710  
711  
712  
713  
714  
715  
716  
717  
718  
719  
720  
721  
722  
723  
724  
725  
726  
727  
728  
729  
730  
731  
732  
733  
734  
735  
736  
737  
738  
739  
740  
741  
742  
743  
744  
745  
746  
747  
748  
749  
750  
751  
752  
753  
754  
755  
756  
757  
758  
759  
760  
761  
762  
763  
764  
765  
766  
767  
768  
769  
770  
771  
772  
773  
774  
775  
776  
777  
778  
779  
780  
781  
782  
783  
784  
785  
786  
787  
788  
789  
790  
791  
792  
793  
794  
795  
796  
797  
798  
799  
800  
801  
802  
803  
804  
805  
806  
807  
808  
809  
810  
811  
812  
813  
814  
815  
816  
817  
818  
819  
820  
821  
822  
823  
824  
825  
826  
827  
828  
829  
830  
831  
832  
833  
834  
835  
836  
837  
838  
839  
840  
84

WHC-SD-EN-TI-266, Rev. 0

WHC-SD-EN-TI-266, Rev. 0  
DATA QUALIFICATION SUMMARY

SDG: 9402L462	REVIEWER: LM	DATE: 4/26/94	PAGE 1 OF 1
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Mercury	UJ	B09W58, B09W59	Holding Times Exceeded
Aluminum	UJ	B09W59	Negative Blank Contamination
Arsenic	U	B09W58	Lab Blank Contamination
Barium	U	B09W59	Lab Blank Contamination
Iron	U	B09W59	Lab Blank Contamination
Vanadium	U	B09W58, B09W59	Lab Blank Contamination
Zinc	U	B09W59	Lab Blank Contamination
Lead	UJ	B09W59	GFAA Analytical Spike
Selenium	UJ	B09W58, B09W59	GFAA Analytical Spike
Thallium	UJ	B09W58	GFAA Analytical Spike
Thallium	UJ	B09W58	PB Analytical Spike
Selenium	UJ	B09W58, B09W59	Matrix Spike
Calcium	J	B09W58, B09W59	ICP Serial Dilution
Iron	J	B09W58	ICP Serial Dilution
Iron	UJ	B09W59	ICP Serial Dilution
Magnesium	J	B09W58, B09W59	ICP Serial Dilution
Sodium	J	B09W58, B09W59	ICP Serial Dilution

**THIS PAGE INTENTIONALLY  
LEFT BLANK**

WELL AND SAMPLE INFORMATION					SAMPLE INFORMATION LOCATION
SAMPLE LOCATION	SAMPLE NUMBER	MATRIX	DATE SAMPLED	NV/V	RADIOCHEMISTRY
199-K-11	B09W42	W	01/11/94	V	7-5
199-K-13	B09W44	W	01/12/94	V	7-7
199-K-18	B09W46	W	01/11/94	V	7-5
199-K-19	B09W48	W	01/11/94	V	7-5
199-K-20	B09W50	W	01/13/94	V	7-7
199-K-21	B09W52	W	01/13/94	V	7-7
199-K-22	B09W54	W	01/13/94	V	7-7
199-K-23	B09W56	W	01/13/94	V	7-7
199-K-27	B09W58	W	01/25/94	V	7-12
199-K-30	B09W60	W	01/20/94	V	7-11
199-K-31	B09W62	W	01/24/94	V	7-10
199-K-33	B09W68	W	01/20/94	V	7-9
199-K-34	B09W70	W	01/13/94	V	7-7
199-K-35	B09W72	W	01/14/94	V	7-7
	B09W88	W	01/14/94	V	7-7
	B09W92	W	01/14/94	V	7-4
199-K-36	B09W74	W	01/14/94	V	7-7
199-K-37	B09W76	W	01/17/94	V	7-8
	B09W90	W	01/17/94	V	7-8
	B09W94	W	01/17/94	V	7-4
699-70-68	B09W78	W	01/12/94	V	7-6
699-73-61	B09W80	W	01/12/94	V	7-6
699-78-62	B09W82	W	01/12/94	V	7-6
EB-1	B09W84	W	01/17/94	V	7-8
EB-2	B09W86	W	01/25/94	V	7-11
TB-2	B09WF1	W	01/21/94	V	7-9

**THIS PAGE INTENTIONALLY  
LEFT BLANK**



### 3.0 GROSS ALPHA AND GROSS BETA DATA VALIDATION

#### 3.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and found to be complete:

B09W92	40039	40529	40984
40023	40053	40971	
40031	40521	40977	

#### 3.2 HOLDING TIMES

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for this analysis is six months.

All holding times were acceptable.

#### 3.3 INSTRUMENT CALIBRATION AND PERFORMANCE

Instrument calibration is performed to establish that the gas proportional counter used for gross alpha and gross beta determination is capable of producing acceptable and reliable analytical data. The initial calibration was performed according to manufacturer's recommendations and consists of an instrument efficiency determination as a function of alpha or beta particle energy, and as a function of the mass of material submitted for counting. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

All calibration results, including efficiency checks and background counts, were acceptable.

#### 3.4 ACCURACY

Accuracy was evaluated by analyzing distilled water samples spiked with known amounts of alpha or beta emitting radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. Acceptable accuracy of spiked sample data must fall within a range of 70 to 130 percent. If spiked sample results were outside this range, associated sample data were qualified as estimated, rejected or not qualified, depending on the individual sample activity.

Due to a LCS percent recovery of 133%, the gross alpha result for sample number B09W66 in SDG No. 40521 was qualified as an estimate and flagged "J".

Due to an LCS analyzed 30 days after the sample analysis, the gross alpha and gross beta results for sample number B09W68 in SDG No. 40529 were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

### 3.5 PRECISION

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the RDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are  $<5 \times \text{RDL}$ , a control limit of  $<2 \times \text{RDL}$  is used for soil samples and  $<\text{RDL}$  for water samples. If either the original or replicate value is below the RDL, the applicable control limits are  $<\text{RDL}$  for water samples and  $<2 \times \text{RDL}$  for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

### 3.6 BLANK SAMPLES

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicated the presence of an analyte above both the MDA and the statistical uncertainty associated with that MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

All blank results were acceptable.

### 3.7 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation and detection limits were recalculated for all samples in each data package to verify their accuracy.

All analyte quantitation and reported detection limits were acceptable.

5060-272-005

### 3.8 OVERALL ASSESSMENT AND SUMMARY

A review of instrument continuing calibration information and QC data indicates that instrument performance was adequate for these analyses. Due to a high LCS percent recovery, the gross alpha result in sample number B09W66 in SDG No. 40521 was qualified as an estimate and flagged "J". Due to an LCS analyzed 30 days after the sample analysis, the gross alpha and gross beta results for sample number B09W68 in SDG No. 40529 were qualified as estimates and flagged "J". Data qualified as estimated are valid and usable for limited purposes only. All other QC data are valid and usable for all purposes.

9165-928-16

**THIS PAGE INTENTIONALLY  
LEFT BLANK**

#### 4.0 ALPHA SPECTROSCOPY DATA VALIDATION

##### 4.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and found to be complete:

B09W92	40039	40529	40984
40023	40053	40971	
40031	40521	40977	

##### 4.2 HOLDING TIMES

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for this analysis is six months.

All holding times were acceptable.

##### 4.3 INSTRUMENT CALIBRATION AND PERFORMANCE

Instrument calibration is performed to establish that the alpha spectroscopy system used is capable of producing acceptable and reliable analytical data. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible. The calibration consists of an instrument efficiency determination for each alpha radionuclide region of interest, and a system resolution assessment as measured by the full-width at half maximum for each peak.

All calibration results, including efficiency checks and background counts, were acceptable.

##### 4.4 ACCURACY

Accuracy was evaluated by analyzing distilled water samples spiked with known amounts of alpha emitting radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70 to 130 percent, while that for a matrix spike is 60 to 140 percent. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimated, rejected, or not qualified, depending on the activity of the individual sample. A chemical tracer is used to determine the efficiency of the analytical method, with tracer yield limits of 20 to 105 percent. Sample

results with chemical yields outside the above stated limits were qualified as estimated or rejected depending on sample activity.

Due to sample analysis occurring several days before and after LCS analysis, alpha spectroscopy results for samples B09W54, B09W52 and B09W50 in SDG No. 400339 were qualified as estimates and flagged "J".

Due to a LCS percent recovery of 32%, the Uranium-235 results for all samples in SDG No. 40039, except sample number B09W88, were qualified as estimates and flagged "J".

Due to a LCS percent recovery of 50%, all Uranium-235 results in SDG No. 40031 were qualified as estimates and flagged "J".

Due to a LCS percent recovery of 51%, the Uranium-235 result for sample number B09W76 in SDG No. 40053 was qualified as an estimate and flagged "J".

Due to a LCS percent recovery of 62%, the Uranium-235 results for sample numbers B09W64 and B09W66 in SDG No. 40521 were qualified as estimates and flagged "J".

Due to a LCS percent recovery of 24%, the Uranium-235 result for sample number B09W68 in SDG No. 40529 was rejected and flagged "UR".

Due to a LCS percent recovery of 67%, the Uranium-235 result for sample number B09W60 in SDG No. 40977 was qualified as an estimate and flagged "J".

Due to a LCS percent recovery of 67%, all Uranium-235 results in SDG No. 40984 were qualified as estimates and flagged "J".

Due to a LCS percent recovery of 3%, all Uranium-235 results in SDG No. 40023 were rejected and flagged "R" or "UR".

All other accuracy results were acceptable.

#### 4.5 PRECISION

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the RDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are  $\leq 5 \times \text{RDL}$ , a control limit of  $\leq 2 \times \text{RDL}$  is used for soil samples and  $\leq \text{RDL}$  for water samples. If either the original or replicate value is below the RDL, the applicable control limits are  $\leq \text{RDL}$  for water

B09W 8/26/16

samples and  $\leq 2 \times \text{RDL}$  for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

Due to a RPD outside QC limits, all Uranium-238 results in SDG No. 40031 were qualified as estimates and flagged "J".

Due to a RPD outside QC limits, all Uranium-234 results in SDG No. 40039, except sample number B09W88, were qualified as estimates and flagged "J".

Due to a RPD outside QC limits, the Uranium-238 result for sample number B09W76 in SDG No. 40053 was qualified as an estimate and flagged "J".

Due to a RPD outside QC limits, the Uranium-234 result for sample number B09W60 in SDG No. 40977 was qualified as an estimate and flagged "J".

Due to RPDs outside QC limits, all Uranium-234 and Uranium-238 results in SDG No. 40984 were qualified as estimates and flagged "J".

All other precision results were acceptable.

#### 4.6 BLANK SAMPLES

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicated the presence of an analyte above both the MDA and the statistical uncertainty associated with that MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

Due to the blank not being analyzed with the SDG, all alpha spectroscopy results in SDG No. 40039 except B09W88 were qualified as estimates and flagged "J".

All other blank results were acceptable

#### 4.7 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitations and detection limits were recalculated for all samples in each data delivery package to verify their accuracy.

Reported MDA values for the following samples were above the RDL:

- Uranium-238 in sample number B09W62 in SDG No. 40971.
- Uranium-234 in sample number B09W86 in SDG No. 40977.

All other analyte quantitation and reported detection limits were acceptable.

#### 4.8 OVERALL ASSESSMENT AND SUMMARY

A complete review of all QC and calibration data indicates that overall system performance was adequate. Due to sample analysis occurring several days before and after LCS analysis, alpha spectroscopy results (except blank, split or duplicate samples) for samples B09W54, B09W52 and B09W50 in SDG No. 40039 were qualified as estimates and flagged "J". Due to low LCS percent recoveries, all Uranium-235 results (except blank, split or duplicate samples) in SDG Nos. 40984, 40977, 40521, 40053, 40031 and 40039 were qualified as estimates and flagged "J". Due to low LCS percent recoveries, the Uranium-235 result for sample number B09W68 in SDG No. 40529, and all Uranium-235 results in SDG No. 40023 were rejected and flagged "R" or "UR". Due to RPDs outside QC limits, all Uranium-238 results (except blank, split or duplicate samples) in SDG Nos. 40984, 40053 and 40031 were qualified as estimates and flagged "J". Due to the blank not being analyzed with the SDG, all alpha spectroscopy results in SDG No. 40039 except sample B09W88 were qualified as estimates and flagged "J". Due to RPDs outside QC limits, all Uranium-234 results in SDG Nos. 40984, 40977 and 40039 (except blank, split or duplicate samples) were qualified as estimates and flagged "J". Reported MDA values for the Uranium-238 result in sample number B09W62 in SDG No. 40971 and the Uranium-234 result in sample number B09W86 in SDG No. 40977 were above the RDL. Data qualified as estimates are valid and usable for limited purposes only. Rejected data are unusable for all purposes and should not be reported. All other QC data are valid and usable for all purposes.



## 5.0 STRONTIUM-90 DATA VALIDATION

### 5.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and found to be complete:

B09W92	40039	40529	40984
40023	40053	40971	
40031	40521	40977	

### 5.2 HOLDING TIMES

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for this analysis is six months.

All holding times were acceptable.

### 5.3 INSTRUMENT CALIBRATION AND PERFORMANCE

Instrument calibration is performed to establish that the low background counting system used for Strontium-90 determination is capable of producing acceptable and reliable analytical data. The initial calibration was performed according to manufacturer's recommendations and consists of an instrument counting system efficiency determination. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

All calibration results, including efficiency checks and background counts, were acceptable.

### 5.4 ACCURACY

Accuracy was evaluated by analyzing soil or distilled water samples spiked with known amounts of beta emitting radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70 to 130 percent, while that for a matrix spike is 60 to 140 percent. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimated, rejected, or not qualified, depending on the activity of the individual sample. A chemical tracer is used to determine the efficiency of the analytical method, with tracer yield limits of 30 to 105 percent. Sample

results above the MDA with chemical yields outside the above stated limits were qualified as estimated or rejected.

Due to a LCS not being run with the entire SDG, samples B09W74, B09W72, B09W54, and B09W70 in SDG No. 40039 were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

## 5.5 PRECISION

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the RDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are  $<5 \times \text{RDL}$ , a control limit of  $\leq 2 \times \text{RDL}$  is used for soil samples and  $\leq \text{RDL}$  for water samples. If either the original or replicate value is below the RDL, the applicable control limits are  $\leq \text{RDL}$  for water samples and  $\leq 2 \times \text{RDL}$  for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

## 5.6 BLANK SAMPLES

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicated the presence of an analyte above both the MDA and the statistical uncertainty associated with that MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

Due to a blank not being run with the entire SDG, samples B09W74, B09W72, B09W54, and B09W70 in SDG No. 40039 were qualified as estimates and flagged "J".

All blank results were acceptable.

## 5.7 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation and detection limits were recalculated for all samples in each data delivery package to verify their accuracy.

All analyte quantitation and reported detection limits were acceptable.

#### 5.8 OVERALL ASSESSMENT AND SUMMARY

A review of instrument continuing calibration information and QC data indicates that instrument performance was adequate for these analyses. Due to a LCS and blank not being run with the entire SDG, samples B09W74, B09W72, B09W54, and B09W70 in SDG No. 40039 were qualified as estimates and flagged "J". Data qualified as estimate is valid and usable for limited purposes only. All other data are valid and usable for all purposes.

944827E 0913

THIS PAGE INTENTIONALLY  
LEFT BLANK

## 6.0 CARBON-14 DATA VALIDATION

### 6.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and found to be complete:

B09W92	40039	40529	40984
40023	40053	40971	
40031	40521	40977	

Due to a lack of distillation log information, Carbon-14 results for sample numbers B09W44 and B09W52 in SDG No. 40039 were qualified as estimates and flagged "J". This information was requested, however, the data were not submitted.

### 6.2 HOLDING TIMES AND SAMPLE PREPARATION

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for this analysis is six months.

The following samples were not analyzed within seven days of distillation and were therefore rejected and flagged "R" or "UR":

- Sample numbers B09W50, B09W54 and B09W72 in SDG No. 40039.

All other holding time requirements were met.

### 6.3 INSTRUMENT CALIBRATION AND PERFORMANCE

Instrument calibration is performed to establish that the low background liquid scintillation counting system used for Carbon-14 determination is capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

All calibration results, including efficiency checks and background counts, were acceptable.

#### 6.4 ACCURACY

Accuracy was evaluated by analyzing soil or distilled water samples spiked with known amounts of beta emitting radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70 to 130 percent, while that for a matrix spike is 60 to 140 percent. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimated, rejected, or not qualified, depending on the activity of the individual sample. A chemical tracer is used to determine the efficiency of the analytical method, with tracer yield limits of 30 to 105 percent. Sample results above the MDA with chemical yields outside the above stated limits were qualified as estimated or rejected.

Due to the LCS not being analyzed with the SDG, all samples results except B09W88 in SDG No. 40039 were qualified as estimates and flagged "J".

The following samples were qualified as estimates and flagged "J" due to high radiochemical yields:

- Sample number B09W42 in SDG No. 40023.
- Sample numbers B09W44, B09W56, B09W70, B09W72 and B09W74 in SDG No. 40039.
- Sample number B09W64 in SDG No. 40521.
- Sample number B09W62 in SDG No. 40971.
- Sample number B09W58 in SDG No. 40984.

All other accuracy results were acceptable.

#### 6.5 PRECISION

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the RDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are  $<5 \times \text{RDL}$ , a control limit of  $\leq 2 \times \text{RDL}$  is used for soil samples and  $\leq \text{RDL}$  for water samples. If either the original or replicate value is below the RDL, the applicable control limits are  $\leq \text{RDL}$  for water samples and  $\leq 2 \times \text{RDL}$  for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

9443278.0915

## 6.6 BLANK SAMPLES

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicated the presence of an analyte above both the MDA and the statistical uncertainty associated with that MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

Due to the blank not being analyzed with the SDG, all samples results except B09W88 in SDG No. 40039 were qualified as estimates and flagged "J".

All blank results were acceptable.

## 6.7 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation and detection limits were recalculated for all samples in each data delivery package to verify their accuracy.

Reported MDA values for the following samples were above the RDL:

- Carbon-14 in sample number B09W60 in SDG No. 40977.

All other analyte quantitation and reported detection limits were acceptable.

## 6.8 OVERALL ASSESSMENT AND SUMMARY

A review of instrument performance and calibration indicates that the overall system performance is adequate. Due to the LCS and blank not being analyzed with the SDG, all samples results except B09W88 in SDG No. 40039 were qualified as estimates and flagged "J". Due to high radiochemical yields, data for numerous samples were qualified as estimates and flagged "J". Due to a lack of distillation log information, Carbon-14 results in sample numbers B09W44 and B09W52 in SDG No. 40039 were qualified as estimates and flagged "J". Sample numbers B09W50, B09W54 and B09W72 in SDG No. 40039 were not analyzed within seven days of distillation, therefore, all associated sample results were rejected and flagged "R" or "UR". Data qualified as estimated are valid and usable for limited purposes only. Rejected data are unusable for all purposes and should not be reported. All other QC data are acceptable for all purposes.

916072646

**THIS PAGE INTENTIONALLY  
LEFT BLANK**



## 7.0 TRITIUM DATA VALIDATION

### 7.1 DATA PACKAGE COMPLETENESS

The following data packages (SDG Nos.) were submitted for validation and found to be complete:

B09W92	40039	40529	40984
40023	40053	40971	
40031	40521	40977	

### 7.2 HOLDING TIMES AND SAMPLE PREPARATION

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for this analysis is six months.

All holding times were acceptable.

### 7.3 INSTRUMENT CALIBRATION AND PERFORMANCE

Instrument calibration is performed to establish that the low background liquid scintillation counting system used for Tritium determination is capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

All calibration results, including efficiency checks and background counts, were acceptable.

### 7.4 ACCURACY

Accuracy was evaluated by analyzing soil or distilled water samples spiked with known amounts of beta emitting radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70 to 130 percent, while that for a matrix spike is 60 to 140 percent. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimated, rejected, or remaining unchanged, depending on the activity of the individual sample.

All accuracy results were acceptable.

## 7.5 PRECISION

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the RDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are  $\leq 5 \times \text{RDL}$ , a control limit of  $\leq 2 \times \text{RDL}$  is used for soil samples and  $\leq \text{RDL}$  for water samples. If either the original or replicate value is below the RDL, the applicable control limits are  $\leq \text{RDL}$  for water samples and  $\leq 2 \times \text{RDL}$  for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

## 7.6 BLANK SAMPLES

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicated the presence of an analyte above both the MDA and the statistical uncertainty associated with that MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

Due to the blank not being analyzed with the entire SDG, all tritium results except B09W88, B09W44 and B09W52 in SDG No. 40039 were qualified as estimates and flagged "J".

Due to the presence of laboratory blank contamination, the following sample was qualified as an estimate and flagged "J":

- Sample number B09W76 in SDG No. 40053.

All other blank results were acceptable.

## 7.7 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation and detection limits were recalculated for all samples in each data delivery package to verify their accuracy.

9473272.0918

All analyte quantitation and reported detection limits and sample results were acceptable.

#### 7.8 OVERALL ASSESSMENT AND SUMMARY

A review of instrument performance and calibration indicates that the overall system performance is adequate. Due to the blank not being analyzed with the entire SDG, all tritium results except B09W88, B09W44 and B09W52 in SDG No. 40039 were qualified as estimates and flagged "J". Due to minor laboratory blank contamination, the Tritium result for sample number B09W76 in SDG No. 40053 was qualified as an estimate and flagged "J". Estimated data are considered usable for limited purposes only. All other QC results were acceptable and usable for all purposes.

6160-2/28/16  
9413278.0919

91-3270-0920

**RADIOCHEMISTRY ANALYSIS, WATER MATRIX, (pCi/L+2 standard deviations)**

Page\_\_1\_\_ of \_\_1\_\_

[illegible]

7-5

[illegible]

WHC-SD-EN-TI-266, Rev. 0

7-7

[illegible]



WHC-SD-EN-TI-266, Rev. 0

7-9

94-3278-0926

**RADIOCHEMISTRY ANALYSIS, WATER MATRIX, (pCi/L+-2 standard deviations)**

Page 1 of 1

[illegible]

WHC-SD-EN-TI-266, Rev. 0

7-10

**TB = Trip Blank**

2017-12-14

Project: WESTINGHOUSE-HANFORD	
Laboratory: Teledyne	
Case	SDG: 40971
Sample Number	B09W62
Location	199-K-31
Remarks	
Sample Date	01/24/94
Radiochemistry Analysis	Result Q
Gross Alpha	1.20
Gross Beta	9.30
Uranium-234	0.58
Uranium-235	0.064 U
Uranium-238	0.33
Strontium-90	2.20
Carbon-14	59.0 J
Thorium	3100

[illegible]

[illegible]

7-13

**THIS PAGE IS INTENTIONALLY  
LEFT BLANK**

## 8.0 REFERENCES

- 9473279-0930  
036-0726746
- EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.
- EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.
- WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.
- WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.
- ATK, Letter, J. W. Goode to K. N. Pool, "Revision to Radiochemical Data Validation Procedures," March 17, 1994.

**THIS PAGE INTENTIONALLY  
LEFT BLANK**